No. 28.

CARL ZEISS

OPTISCHE WERKSTÄTTE

JENA

MICROSCOPES

AND

MICROSCOPICAL ACCESSORIES

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1889.

Every article specified in this Catalogue will be supplied singly or otherwise at the prices subjoined.

The price of completely fitted Microscopes is in all cases the sum-total of the individual items.

Payment must be made in ready money without discount, either in cash or bills drawn upon a chief town in Germany, cheques drawn upon English banks also accepted.

Goods are forwarded, value declared, at the risk and cost of the receiver — foreign orders are despatched by the shortest route and with every precaution.

It is requested that the name and destination be plainly written in all orders and, to prevent any mistakes, please quote the number or date of this Catalogue.

Jena, 1889.

Carl Zeiss,
Optische Werkstätte.

A selection of completely fitted Microscopes for the most varied requirements will be found at the end of this list.

Contents.

Those pieces of apparatus indicated by an asterisk are such as have originated in our factories, i. e. either introduced by us as absolutely new or, at any rate, first made by us in the manner here described.

Objectives and Eye-pieces.

Since the publication of our last catalogue in 1885 a considerable advance has been made in the optical equipment of the microscopes constructed in our factories. The technical glass factory established here with our cooperation, after years of experiment and research by Dr. SCHOTT and Prof. ABBE, has produced a series of new glasses (borate and phosphate glass in particular) for optical purposes, which in refractive power and colour dispersion greatly excel the ordinary crowns and flints. By the use of this material and the application of new formulæ in the construction of the lenses, since the year 1886 we have produced microscope objectives which possess a considerably more perfect correction both of chromatic and spherical aberration, and therefore a much greater concentration of light in the image, than has hitherto been attained. For special use with these objectives we have likewise introduced eye-pieces of new construction which, in addition to other advantages, give almost perfect achromatism and sharpness of image over the whole visual field.

These new productions, first brought out in August 1886 under the designations Apochromatic Objectives and Compensating or Projection Eye-pieces, have since become widely known and universally accepted. During

the last few years they have been the subjects of numerous comments in the various technical journals and are now included in our catalogue among the ordinary articles of manufacture.

The present catalogue includes, in addition to this new series, most of our older achromatic objectives and ordinary eye-pieces. For although it may confidently be predicted that before very long the apochromatics must entirely supplant the older objectives in the more difficult departments of microscopical research, there are problems enough in microscopy which do not demand the highest attainable perfection of apparatus and in which the ordinary achromatic microscope will render as good and sufficient service as it has done in the past, provided it is good of its kind, and is made with care and understanding.

The older type of objectives and eye-pieces again from their simple construction can be supplied at a considerably lower price than the much more complicated systems of the new series, the production of which will probably be limited for a long time yet on account of the extraordinary demand they make on the skill of the optician.

With deference to these considerations, only those numbers are erased from the list of our former achromatic objectives, whose special purpose is undoubtedly better fulfilled by the apochromatics — namely a few of the weaker dry lenses of relatively large aperture and the very short and very long focus lenses in the series of water and homogeneous immersions. The older kind of objectives moreover have been considerably improved in detail by the use of the new varieties of glass and such other alterations as their type of construction permitted.

In the special catalogue of 1886 we made an attempt to introduce a rational system of designation to specify the objectives and eye-pieces of the new series in place of the prevailing purposeless and arbitrary method.

Although we consider this system more practical than any of the usual ones of names and numbers and a step in advance if it could be universally adopted,

we have thought it better for the present to exclude therefrom our older series of objectives and eye-pieces.

Great alteration in the focal lengths of both objectives and eye-pieces would have been necessary in order to designate these by the same convenient round numbers as in the new series. Our microscopes moreover being in such extensive use, so many microscopists have become accustomed to the focal-lengths hitherto adopted and to the usual denotation of the various items, that a radical alteration in this direction would no doubt give rise to considerable confusion. On these grounds the former designation of the objectives by letters and the arbitrary numeration of the eye-pieces has been retained in the older series.

Our **Objectives** are all constructed on the formulae of Prof. ABBE of Jena and subject to his constant supervision.

Every detail of their construction being mathematically computed, combined with perfect technical methods of working and a systematic control of each phase of their manufacture, obviates all testing and guarantees an extraordinary uniformity of our glasses from the highest to the lowest, at the same time altogether excluding specimens of inferior quality. All objectives are uniformly free from spherical aberration up to the marginal zone (proper thickness of cover with the higher powers being understood) and as far as possible perfectly corrected for colour. Special consideration is also given to the removal of aberrations outside the axis and to flatness of field.

Working Distance. Owing to the importance of a good working distance for the convenient and safe employment of the higher powers, particular attention is given to this factor in calculating the formulae of the various glasses. Our stronger objectives possess therefore an unusually large amount of working distance in comparison with their focal length and aperture. All, even the very highest, may be used with cover-glasses of 0.2 mm or more in thickness.

Body Length. The whole of the objectives in this catalogue are adjusted to a body length of 160 mm. or of 250 mm., according to order. The length is reckoned from the contact surface of the objective thread to the upper end of the body on which the eye-piece rests. This may be read off directly on stands of our make by the divisions on the draw tube. The objectives a, aa, A, B, C, F and J even if adjusted for the short (continental) tube, may be used on stands of English model with 10 inch bodies without appreciable loss. All the rest, particularly the apochromatic series and also the homogenous immersions, perform more or less deficiently as ordinarily adjusted for continental microscopes on stands of English model.

In foreign orders it should always be stated whether the objectives are to be adjusted for the short (continental) or for the long (English) body.

Thickness of Cover. All objectives in fixed mounts are, unless otherwise ordered, corrected for a medium thickness of cover between 0.15 and 0.20 mm. In the higher series from D upwards the thickness of cover consistent with the most perfect correction is indicated on the side of the mount by small figures (mm). It is as a rule sufficient for ordinary work, with such objectives as we supply only with non-correcting mounts, to use covers of an estimated medium thickness.

Homogeneous immersion objectives are, within wide limits, independent of the thickness of cover.

Correction Adjustment. The graduation and numbering on the correction collar, read off on the fixed index, indicates directly at each position of the collar the corresponding thickness of cover in hundreths of a millimeter coincident with the best correction at this point. The correction for cover must be carefully adjusted, particularly in the apochromatics 4.0 and 2.5 mm and the achromatics F and J, in order to ensure the best possible performance of these objectives.

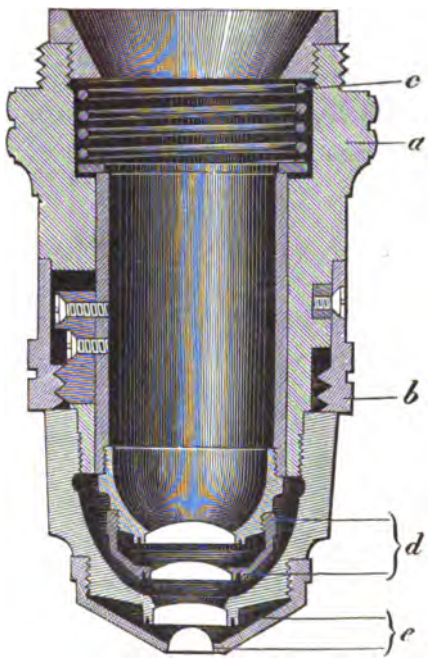

Fig. 1.

The homogeneous immersion objectives are only supplied in fixed mounts, for as already stated, they are independent of thickness of cover between rather wide limits, and also because any alteration in the distance of their lenses interferes with the perfection of their correction. Considerable variations in thickness of cover are best compensated for

by slightly lengthening the body-tube for thinner covers
„ „ shortening „ „ „ „ thicker ones.

The immersion fluid recommended for the homogeneous objectives is Cedarwood oil (from Juniperus virginiana) which we have used from the first. Latterly we supply the same in a thickened condition, which not only does away with its inconvenient fluidity but at the same time obtains almost perfect identity of refractive index with that of the cover-glass. A bottle of this oil is given with each objective and supplied subsequently when required. We expressly request

therefore, that no immersion fluids from other sources be used with our objectives, or at least until these have been carefully tested as to their proper refractive power, because considerable loss in the performance of the objective may be expected if unsuitable fluids are employed.

The mounts of all objectives are provided with the English **standard thread.** In the series from A to J however, and also in D D when not fitted with correction adjustment, the mount containing the lenses is made to unscrew from the adapter and if required used with the narrow-gauge thread.

The name of the firm is engraved on the adapters of all objectives; on the apochromatics also the aperture, focal-length and body-length for which they are adjusted, and on the ordinary glasses the letter by which they are designated.

*Apochromatic Objectives.

We can only briefly state here the essential features of these glasses and must refer to the paper of our colleague Prof. ABBE „Ueber Verbesserungen des Mikroskops mit Hilfe neuer Arten optischen Glases" (Sitzungsberichte der med.-naturw. Gesellschaft zu Jena. Sitzung vom 9. Juli 1886)[1]) for a detailed statement of the scientific aims towards which the onstruction of this series is directed and to the well known work of DIPPEL „Das Mikroskop" (2. Aufl., Braunschweig 1882) in regard to the general principles.

These objectives are distinguished from all other systems of lenses hitherto used with the microscope, by fulfilling simultaneously two conditions which have not otherwise been attained by any kind of optical construction — viz. 1) the union of three different colours of the spectrum in one point of the axis, that is to say, the removal of the so-called secondary spectrum of the older achromatics, and 2) the correction of spherical aberration for two different colours, in place of one in the brightest part of the spectrum.

All optical systems hitherto constructed, microscopes included, project a sharp image with one kind of light only (with yellow-green in such as are used with eye-pieces and blue-violet in photographic lenses), the other rays give more and more confused pictures, appearing partly as colour fringes and partly as a general blur. In the apochromatics however the projected images are nearly equally sharp with all the colours of the spectrum and the picture consequently is always of the same perfection, whether white or compound light is employed, or monochromatic illumination with any section of the spectrum.

1) Sent gratis on application.

In the older series again the colour correction is really good for one zone of the objective only, becoming imperfect towards both the margin and the centre of the aperture, whilst in the apochromatics it is corrected equally for all zones. Consequently in using ABBE's test-plate scarcely more colour is perceived with the most oblique illumination than with central light.

Finally even in the zone of most perfect colour correction of the ordinary achromatics only two colours can be combined in one point. The various coloured images therefore can only fall on the same spot in pairs between which is a considerable difference in focus. In the new series however three colours are combined in one point, whereby the amount of focal difference for the various sections of the spectrum, from the visible to far into the chemically active portion, is diminished to such an extent as to be practically non-existent, and this, as before stated, equally for each zone of the objective. The individual images of each single colour are therefore made to combine and cooperate most accurately in one spot[1]).

The practical advantage of these novelties is at once apparent. A considerably increased concentration of light with ordinary eye-piece observation as for every other purpose — and this by any kind of illumination, central or oblique, white or monochromatic — confers on these glasses an acknowledged superiority both in the power of their performance as in the diversity of their application.

It may be stated in reply to numerous inquiries and occasionally expressed doubts, that objectives of this kind are entirely constructed from glass which affords the best guarantee for their durability. Whenever any mistake has been proved in this direction the questionable glass has been always at once replaced by one of greater resistence. But obviously it cannot be expected that the lens surfaces will remain intact if the setting is unscrewed and they are exposed to the action of fluids and vapours.

The natural colours of objects, even in the more delicate tints, are reproduced unaltered by these objectives. Close to the margin of the field, the images are nearly as sharp as in the centre, though the high aperture and the relatively great working distance render a moderate degree of curvature of the image unavoidable in these objectives just as in the older ones.

As a result of the great concentration of light afforded by these objectives they permit the use of very high eye-pieces without detriment to the ac-

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1) This higher order of achromatism is theoretically and practically quite a different thing from a mere improvement of the ordinary kind of achromatism, by which the secondary spectrum could be diminished, but two colours only were made to combine. The word „apochromatic" was introduced by Prof. ABBE as a technical term for this other kind of achromatism, long familiar to opticians as an idea but only just lately practically realised.

curacy or brightness of the image, thus giving high magnifying power with relatively long focal length, and enabling a series of very varying amplifications to be obtained with the same objective.

In the annexed list beside the apertures and foci the corresponding objective magnification is stated, i. e. the magnification which the objective alone would give at the distance of distinct vision if used as a simple lens. This is simply 250 (distance for distinct vision) divided by the focal length of the objective in mm. For instance, the objective magnification of a 3^{mm} is

$$\frac{250}{3} = 83.3.$$

The apertures given are the guaranteed minimum values; the stated focal lengths are adhered to as closely as possible.

List of the Apochromatic Objectives.

	Numerical aperture	Equivalent focus in mm	Initial magnification	Price *Marks*
Dry Series	0.30	24.0	10.5	140.—
		16.0	15.5	100.—
	0.65	12.0	21	170.—
		8.0	31	130.—
	0.95	6.0	42	220.— with corr. adjust.
		4.0	63	180.— with corr. adjust.
Water Immersion	1.25	2.5	100	300.— with corr. adjust.
Homogeneous Immersion	1.30	3.0	83	400.—
		2.0	125	400.—
	1.40	3.0	83	500.—
		2.0	125	500.—

The three objectives 24 mm, 12 mm and 6 mm of the dry series are constructed exclusively for the 10 inch-tube; all the others for both short and long tubes.

*Compensating Eye-pieces.

All objectives of considerable aperture, from their peculiar construction (hemispherical fronts), display certain colour defects in the extra-axial portion of the visual field (chromatic difference of the magnification), even if perfectly achromatic in the centre. The various coloured images which when combined form the final picture (DIPPEL, l. c. p. 225) are of different dimensions, the blue greater than the red. Whether an image be directly projected by such an objective or whether it be examined with an eye-piece (even of the achromatic or so-called aplanatic form) colour fringes will be observed, increasing towards the margin of the field.

This peculiarity is also possessed by the apochromatic objectives, and in the weaker ones it has been purposely introduced in about an equal degree because the error is nearly perfectly eliminated by means of suitable eye-pieces. These are so constructed as to possess the same amount of error of the opposite kind, that is, they magnify the red more than the blue. Such eye-pieces therefore compensate the different magnification of the objective and the images appear free from colour up to the margin of the field.

This compensatory action of the eye-pieces is manifested, particularly in the higher numbers where the limiting diaphragm is placed outside the lenses, by the fact that the edge of this diaphragm, shows a red border, whilst the image quite close at the edge is colourless.

The setting of the eye-pieces is so arranged, that the lower focal point of all numbers in each series lies in the same plane when inserted in the body-tube. No alteration of focus is therefore required on changing the eye-piece, and the optical tube-length (i. e. the distance between the upper focal point of the objective and the lower one of the eye-piece), which is the standard factor for the magnifying power, remains constant. This optical tube-length in the continental microscopes (excluding small differences between the various objectives) equals 180 mm, provided that the length of the body, from the contact surface of the objective to the upper end of the tube on which the eye-pieces rest, is 160 mm.

The eye-pieces of extremely low power designated **Searchers** serve the purpose of reducing to its lowest limits the available magnification with each objective,

thus facilitating the preliminary examination of specimens and the labour of searching for particular points with high powers. Thus N°. 1 of this series enables an objective to be employed with its own initial magnifying power, i. e. as if it were used as a simple lens without an eye-piece. They will be found of special service with immersion objectives, where great inconvenience is caused by having to change a lens already adjusted for another of lower power.

The working eye-pieces for regular observation are likewise of entirely new construction. They begin in both series with a magnifying power of 4 and are easy to work with even in the highest numbers. The eye-point in all lies so high above the eye-lens and the diameter of the lens itself is so large, that the usual inconveniences attending the use of eye-pieces of short focus are entirely obviated.

The ordinary drawing prisms and particularly the ABBE Camera may be used without difficulty on all the compensating eye-pieces from the even distance of their eye-points. The most appropriate for the purpose however are the weaker powers 4 and 6.

The numeration of these eye-pieces is carried out on the principle suggested by Prof. ABBE. The number which denotes how many times an eye-piece increases the magnifying power of the objective when used on a body of given length, affords the proper measure of the eye-piece magnification and at the same time the figures for rational numeration. On this basis the following series is arranged according to their magnifying power 1, 2, 4, 6, 8, 12, 18, 27, and these figures likewise serve as their designation.

The magnification obtained by combining a compensating eye-piece with any apochromatic objective is arrived at directly by multiplying its number by the initial power of the objective as given in the preceding list. An objective of 3.0 mm focus for example gives from itself a magnification of 83.3 (at the conventional distance of vision of 250 mm); eye-piece 12 therefore gives with this objective $12 \times 83.3 = 1000$ for the same distance.

For the continental and the English model microscopes two distinct series of compensating eye-pieces are made. The corresponding numbers in both series are of a different focal length according to the different length of the tubes.

The eye-pieces 1 and 6 are only made for the continental tube and 27 only for the English.

List of Compensating Eye-pieces.

	Searcher Eye-pieces		Working Eye-pieces					
Eye-piece No:	1	2	4	6	8	12	18	27
	For the continental body:							
Equivalent focal length in mm	180	90	45	30	22.5	15	10	—
Price: Marks	20.—	20.—	20.—	20.—	30.—	30.—	25.—	—
	For the English body:							
Equivalent focal length in mm		135	67		34	22.5	15	10
Price: Marks		25.—	25.—		35.—	30.—	30.—	25.—

Table of Magnifications of the Apochromatic Objectives with the Compensating Eye-pieces

for an image distance of 250 mm.

Focus of the objective	Searcher Eye-pieces		Working Eye-pieces					
	1	2	4	6	8	12	18	27
24.0		21	42		83	125	187	281
16.0	15.5	31	62	94	125	187	281	
12.0		42	83		167	250	375	562
8.0	31	62	125	187	250	375	562	
6.0		83	167		333	500	750	1125
4.0	62	125	250	375	500	750	1125	
3.0	83	167	333	500	667	1000	1500	
2.5	100	200	400	600	800	1200	1800	
2.0	125	250	500	750	1000	1500	2250	

Carl Zeiss, Optische Werkstätte, Jena.

*Projection Eye-pieces.

These are used for projecting an image on a screen for demonstration or upon a photographic plate. They consist of a convex lens and a compound system, which is most carefully corrected both spherically and chromatically and is entirely free from secondary chromatic aberration and from difference of focus between the visual and chemical rays. A diaphragm is placed between the lenses for limiting the field, and the compound lens can be made to approach or recede from this diaphragm. The cap of the projection eye-piece forms a diaphragm by which any reflex from the body-tube is entirely cut off. The aperture of this diaphragm is made to correspond with the greatest aperture of the apochromatics.

They are specially corrected for our apochromatics on the principle of the compensating series, but may nevertheless be advantageously employed with ordinary achromatics of large aperture.

The designation of these eye-pieces corresponds to that of the compensating series according to their magnification, which for the 160^{mm} body equals 2 and 4, and for the 250^{mm} body 3 and 6.

The magnification for any distance of image from the eye-piece is obtained, by dividing this distance, expressed in millimeters, by the focal length of the objective in use and multiplying the result by the number of the projection eye-piece employed. Thus the objective of 3 mm gives with the projection eye-piece 2 an image magnified 1000 times at a distance of 150 cm $\left(\frac{1500}{3} \times 2 = 1000\right)$. This rule holds good strictly speaking for long distances only; for short distances it gives too high a reading.

The image distance may be reduced in the case of 2 and 3 to about 400 mm and with 4 and 6 to about 250 mm (reckoning from the eye-piece); it may be increased to any desired amount.

For further details see special Photo-micrographic catalogue.

Price of the Projection Eye-pieces 40 Marks each.

Achromatic Objectives.

For the general character of these objectives see the remarks on pages 4—6.

The **objectives a** are simple achromatic lenses, so mounted that, notwithstanding their great focal length, the body of the microscope remains at its ordinary elevation during observation. In a_1 the thread is so placed that when screwed home the lens is inside the body. They are only intended for use with the lower eye-pieces.

Objective a* consists of two achromatic lenses, a concave front lens and a convex posterior system. By means of a ring rotating like a correction collar the two lenses can be approximated or withdrawn, whereby, using one of the lower eye-pieces, the magnification is changeable in the proportion from about 1 to 2. This graduation of the magnifying power is obviously useful for many purposes.

Besides the $^1/_{12}$ homogeneous immersion of 1.30 to 1.35 aperture we construct one of 1.20 at a correspondingly lower price.

We no longer supply the objectives BB, CC; G, K, L (Water immersions) and $^1/_8$ and $^1/_{18}$ (hom. immers.) of our former catalogues, because the special design of these is now, in our opinion, better fulfilled by the apochromatics.

All objectives are also supplied adjusted for the 10 inch body and in the English form of mount.

List of Achromatic Objectives.

	Designation	Numerical aperture	Equivalent focal length	Price without Correction	Price with Correction
				Marks	
Dry Series	a_1	—	40mm	12.—	
" "	a_2	—	35mm	12.—	
" "	a_3	—	30mm	12.—	
" "	a*	—	38—26mm	40.—	
" "	aa	0.17	26mm	27.—	
" "	A	0.20	18mm	24.—	
" "	AA	0.30	18mm	30.—	
" "	B	0.35	12mm	30.—	
" "	C	0.40	7mm	36.—	
" "	D	0.65	4.3mm	42.—	
" "	DD	0.85	4.3mm	54.—	74.—
" "	E	0.85	2.7mm	66.—	86.—
" "	F	0.85—0.90	1.85mm	84.—	104.—
Water Immersion	H	1.15—1.20	2.4mm	110.—	130.—
	J	1.15—1.20	1.8mm	144.—	164.—
*Homog. Immersion	$\frac{1}{12}$	1.20	2.0mm	160.—	
	$\frac{1}{12}$	1.30—1.35	2.0mm	300.—	

Magnification

of the Achromatic Objectives with the several Huyghenian Eye-pieces

with a body-length of 160 mm and an image distance of 250 mm.

Eye-piece:	1	2	3	4	5	
a_1	7	10	15	20		a_1
a_2	11	16	23	30		a_2
a_3	20	30	40	50		a_3
a*	4—8	7—14	10—20	15—30		a*
aa	25	35	47	60	77	aa
A, AA	37	50	70	90	115	A, AA
B	60	85	115	145	185	B
C	105	145	200	265	325	C
D, DD	175	240	325	420	540	D, DD
E	280	390	535	680	865	E
F	415	585	790	1000	1277	F
H	320	440	610	770	985	H
J	340	585	810	1030	1314	J
$\frac{1}{12}$	385	530	730	925	1180	$\frac{1}{12}$
	1	2	3	4	5	

Huyghenian Eye-pieces.

We supply these for use with the ordinary achromatic objectives. Their focal lengths and magnifications are shown in the following table.

Eye-piece No:	1	2	3	4	5
Focus in mm	50	40	30	25	20
(Eye-piece) magnification	3	4	5,5	7	9

Price 7 Marks each.

The magnification is computed by the same rule as in the compensating series (see page 12), but having regard to the various positions of their lower focal planes.

With regard to the choice of eye-pieces for a microscope we would remark, that all our higher objectives are capable of giving effective magnifications for regular observation even with N°. 4.

With the higher power achromatics, from DD upwards, the compensating eye-pieces give an image free from colour, particularly at the edge of the field.

We no longer supply the „orthoscopic" eye-pieces of former catalogues, their place being taken by the compensating or projection series.

Accessory Apparatus for testing the fundamental properties of Microscopical Objectives.

No.		Marks
1	***Apertometer** after ABBE, for estimating the numerical and angular aperture of objectives (Journ. of the R. Micr. Soc. Jany. 1878, p. 19). Semi-circular disc of thick plate glass 90 mm in diameter, with reflecting prism for throwing horizontally-incident light in the axis of the microscope; to lie on the stage of the microscope. The objective to be tested is adjusted to a central spot on the surface of the disc. The limits of the aperture are indicated by moveable indices on the periphery of the disc; a special auxiliary objective is used for observation, which screws into the draw tube and is adjusted by it to the image of the indices. The reading is given by two series of divisions on the glass disc, one of which shows the angle of aperture in air and the other the numerical aperture. For use on either of the larger stands with draw-tubes. Including the auxiliary objective, in case (fig. 2)	60.—

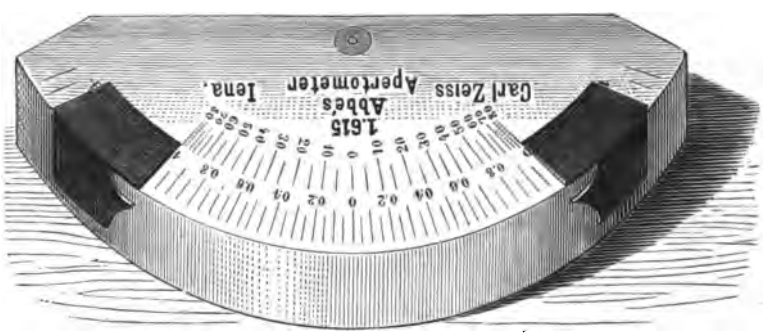


Fig. 2.
Apertometer.

2	***The same apparatus,** the glass disc being provided with a metal foot on which the indices move in a groove and are therefore more easily adjusted	80.—

No.		Marks
3	***Test-plate** after ABBE — for testing the spherical and chromatic aberration of objectives, and for estimating the thickness of cover compatible with the most perfect correction. Six cover glasses, having the exact thickness marked	

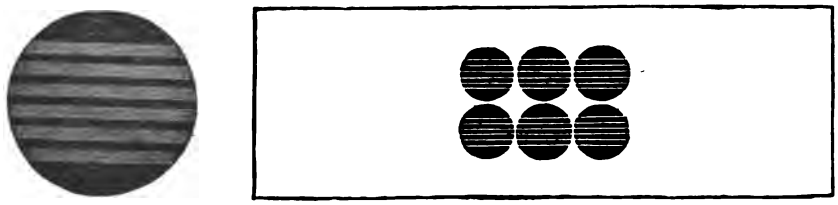


Fig. 3.
Test-plate No. 3.

	on each (0.09 to 0.24 mm), cemented in order on a slip, their lower surface silvered and engraved with parallel lines, the contours of which form the test. For use with the ABBE Condenser. (See Instruction for use.) In case	7.—

Stands.

The general form of our stands, like most others of continental design, is modelled on the type first introduced by OBERHÄUSER and developed by HARTNACK. It is more or less universally acknowledged that the size and general arrangement of this kind of stand best corresponds to the requirements of scientific research. The extensive employment of the continental forms even in English and American science schools, as well as the testimony of numerous competent investigators, shows that, for scientific work at least, they are preferred even there to the more elaborate of the so-called English stands.

Latterly we have endeavoured to perfect the mechanical details of the microscope, and have made several improvements in the three main factors which essentially constitute the stand viz. the stage arrangements, the focussing and the illumination.

A. The Stage.

The dimensions of the stage in all our stands (except in the Laboratory stands VI and VII) are sufficiently large to allow the use of any size slip or culture plate.

The diameter of the stage opening in stands I to V is 33 mm, in consequence of the large field of the longer focus objectives (especially the projection objective of 75 mm focus). It may be reduced to the diameter of the upper lens of the condenser, by slipping in a diaphragm provided for the purpose, when very small slips are employed.

The height of the stage above the table is reduced to the lowest limits which will permit the application of the ABBE condenser in stands II[a] to V, in order

that the hands may be supported by the table when manipulating on the stage. In the larger stands (I, I^a, photographic and mineralogical stands) the stage is made higher, to facilitate the employment of various methods of illumination other than the ABBE condenser, which are occasionally required.

Stands IV, V^a and stand „BABUCHIN" are made with **fixed stages.**

Mechanism for moving the object is provided in N^{os}. I, I^a, II^a, the photographic and mineralogical stands. This consists of the following arrangements:

a) Revolution of the stage and body round the optic axis (stand I).

b) Revolving stage-plate with arrangement for centering (N^{os}. I^a, II^a, mineralogical stand). (Fig. 4.)

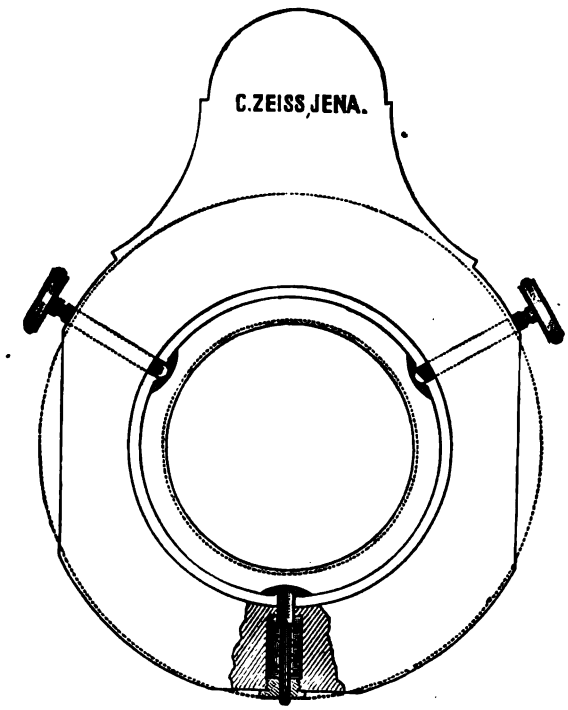


Fig. 4.
Revolving stage-plate with arrangement for centering.

c) Mechanical stage (stand I^a and „for photo-micrography"). This, which possesses the general arrangement of the English form of moveable stage, is substituted in place of the rotating vulcanite stage-plate in stand I^a. (Fig. 5.) The micrometer stage in the photo-micrographic stand is made for delicate adjustments of the object. (Fig. 6.)

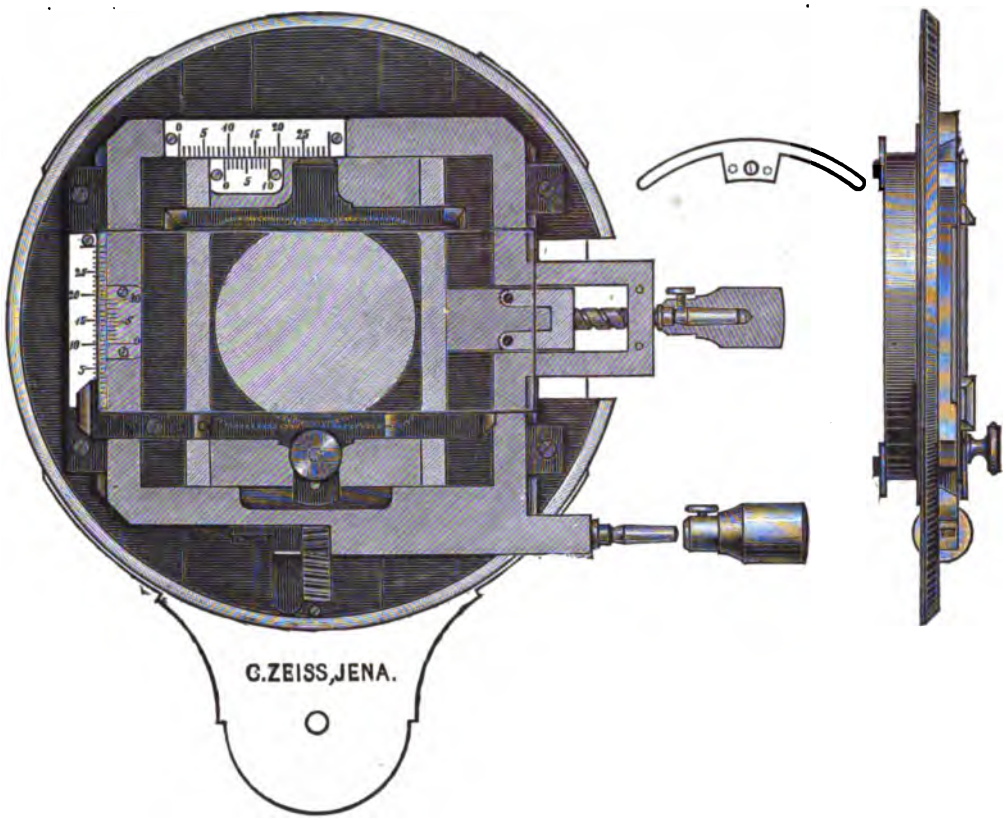


Fig. 5.
Mechanical stage of stand I[a].

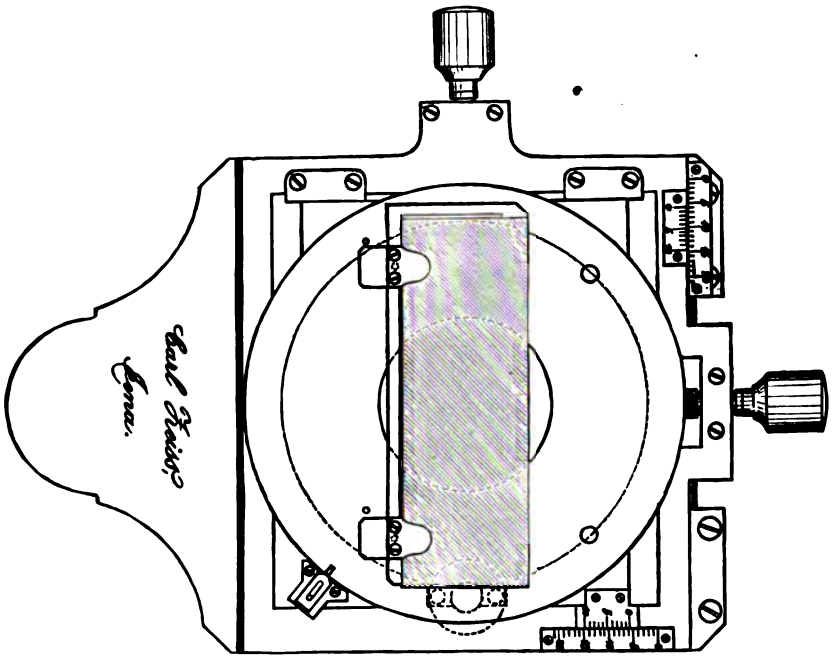


Fig. 6.
Mechanical stage of photographic stand.

Mechanical stage movements were formerly peculiar to English microscopes and absent in the great majority of continental instruments. It is only lately that they have received much attention on the continent but for some years they have been experimented with in our factories. We have become convinced that mechanical movement of the object is of advantage in the following cases:

1. In the employment of high power lenses, when it is required to bring a point seen at the margin into the middle of the field. This as is well known, when done by hand, is often a sore trial of patience. The small amount of movement necessary to accomplish this is provided for, in a limited way, by the centering arrangement of the revolving stages in stands I[a] and II[a] (see above b).

2. For the systematic examination of specimens.

3. For counting particles within a certain field of the object.

4. For registering certain spots in specimens in order to find them again readily.

5. For the projection of real images.

In cases 2 and 5 a mechanical stage must be chosen more or less according to the requirements; for the former like that of stand I[a], for the latter that of the photo-micrographic stand. These are both so constructed as not to interfere in the least degree with any other manipulative process, and they may be retained in situ even when using pure-cultivation plates. We consider this to be a great improvement on the ordinary form of mechanical motion, which must be removed from the stand during certain investigations with the instrument. For this reason we have ceased to manufacture the so-called pendulum and the REICHERT stages.

B. The Adjustments.

The coarse adjustment. Whilst the sliding form of coarse adjustment, retained in the cheaper stands V, VI and VII, has undergone scarcely any alteration since its introduction, the rack and pinion motion in N[os]. I—IV, IX and the mineralogical, photographic and „BABUCHIN model" stands has recently been very considerably improved by us. We have constructed special machinery for the accurate production of the (diagonal) gearing, and this motion is now made so perfect that objectives of medium power can be focussed by it alone without having recourse to the micrometer screw.

The fine adjustment. This has also lately received our special attention. The result is a micrometer movement of new construction now fitted to all our stands except N[o]. IX. (For detailed description see Zeitschrift für wissenschaftliche Mikroskopie III, 2, p. 207.) As will be seen from the annexed illustration (fig. 7) the advantage of this new arrangement is that the force exercised by the micrometer screw, is transferred to the moveable limb by a

single contact between hardened steel surfaces. This ensures an extremely delicate and equable motion of the limb carrying the body.

The divisions on the milled head of the micrometer screw in stands I—IV are for registering the vertical movements of the body. In the new stands each division corresponds to 0.01 mm elevation or depression of the body-tube in the optic axis.

By this means measurements of thickness may be made with some degree of accuracy. The upper and lower surfaces of the object are successively focussed and the amount read off on the milled head by the fixed index. In doing this it must be remembered to make both adjustments by an equable rotation of the screw. The depth of the layers of air is then proximately equal to the difference between the two readings.

The thickness of layers of any other substance may also be measured by the same arrangement. **Estimation of the thickness of cover-glass** for instance is best done as follows: With a high-power dry lens (D or E) N° 3 or 4 eye-piece and central illumination, take covers of known thickness — such as those on the Abbe Test plate — focus their upper and lower surfaces and note the apparent thickness so obtained. A comparison of this with the known true value gives, once for all, the amount of reduction which must be made, on measuring any other covers with the same objective under precisely similar conditions of illumination. Roughly speaking this equals 3/2 (the refractive exponent of glass). The thickness of specimens is estimated in a similar manner.

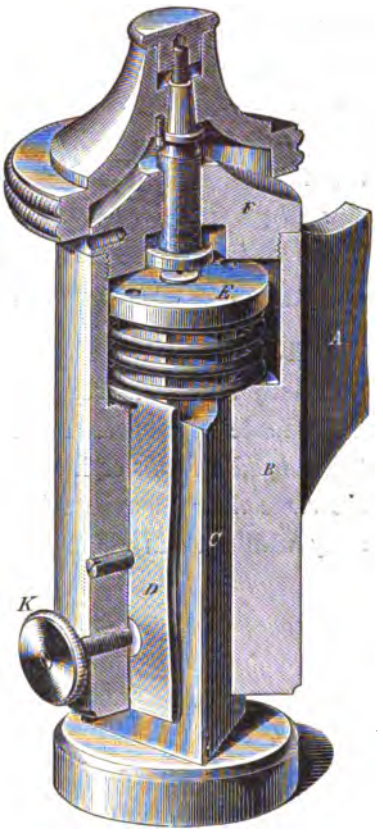


Fig. 7.
New form of fine adjustment.

The medium body length of our stands is 160 mm from the attachment of the objective to the upper end.

The draw tubes for lengthening or shortening the body are furnished with a millimeter scale to show the amount of withdrawal. The lower end is tapped with the standard thread to take the auxiliary objective used with the apertometer.

C. The Illumination of the Object.

The modern microscope is essentially constructed for illumination with transmitted light. Ordinary microscopic observation solely requires an illumination by white (day or lamp) light without limitation of the field, but the incident pencil should be capable of wide variation as regards its angular aperture (wide or narrow illuminating cone) and its direction (central or oblique light). These requirements are fulfilled by the **ABBE Condenser**, first introduced by us in 1873. It is now so generally employed and so universally acknowledged as an indispensable accessory in the finer kinds of microscopic work, that it properly forms an essential adjunct to all stands intended for scientific research.

To facilitate the **employment of the cylinder diaphragms**, which formerly were only applicable after removal of the entire illuminating apparatus, we have lately made certain alterations in the mechanical part of the ABBE Condenser. Other special forms of illuminator described in N^{os} 20—23 can also be applied to the same fitting, so the sub-stage formerly required to adapt them has been done away with even in stand I.

The cases for all the large and medium stands are of solid mahogany. The cupboard form has been substituted for the ordinary box, as the instrument is certainly more easily taken out and replaced in them without the least derangement of its fittings. The size is reduced as much as possible for the sake of compactness, but they are sufficiently roomy to permit of the instrument being replaced with the objective (on the nose-piece even) and eye-piece in situ, and to contain an extensive assortment of objectives, eye-pieces and the ordinary accessory apparatus.

If desired they can be furnished with:

Metal name plates, including engraving, to screw on the door, **Mk 5.—**

Leather travelling cases according to size . . . . . **Mk 10—20.—**

The ordinary cases are included in the price of the stand. Cases of particular design, in walnut or ebony, can be made if desired at an extra charge.

Specification and Price of the various Stands.

A. Large Stands.

No.		*Marks*
4	**Stand I.** Stage and body revolving round the optic axis. Coarse adjustment by rack and pinion, fine adjustment by micrometer screw with divided head. Draw-tube with millimeter divisions. ABBE Condenser (see p. 46) with rack and pinion adjustment. Iris diaphragm of the newest construction with full aperture. Condenser system of 1.40 mm. aper. interchangeable with cylinder diaphragm. (Fig. 8.)	300.—
	Centering arrangement to the diaphragms or sub-stage condenser (see p. 47) is only supplied if specially ordered. Price M. 20.—	
	The sub-stage formerly supplied with this stand for holding a centering diaphragm or other apparatus and also the extra mirror, is done away with, the new arrangement of the ABBE Condenser permitting the use of these accessories.	

Fig. 8.
Stand I.

No.		Marks
5	**Stand Ia.** Stage with rotating vulcanite disk, which is removable and can at any time be replaced by the mechanical stage described below. The rotating disk is centered by means of two milled-head screws (fig. 4). This adjustment also serves to give slight motion to the object. Otherwise exactly as stand I. (Fig. 9.) Without mechanical stage . . . . . 300.— With „ „ . . . . . 400.— The mechanical stage is shown in Fig. 5. It is an improvement on the English form. The improvements are as follows: 1. It permits the use of any sized slips. Culture plates may be put upon the stage by removing the clips and milled heads, which is very easily done. 2. It is divided to serve as a finder, the divisions with the vernier reading to $^1/_{10}$ mm. To use this arrangement the slip must always be pushed against the projection at the left hand of the object holder, so that it always occupies the same position relative to the rectangular movements of the stage. The divisions can also be used for measurement, if the accuracy required does not exceed 0.10 mm. 3. The stage is available with every method of illumination. Attachment of the mechanical stage is effected in the simplest manner on removing the rotating disk, which also involves no complicated manipulation.	

Fig. 9. Stand I[a] with mechanical stage.

No.		Marks
6	**Stand for Photo-micrography.** Extra large stage, with arrangement for delicate motion of the object as described below, and which also permits the use of any sized slips (including culture-plates). Body very short and of great diameter, so that photographic objectives of very long focus may be used within it. Draw-tube with millimeter divisions. Coarse adjustment by rack and pinion, fine adjustment by micrometer screw of new construction with divided head. The edge of this head is geared for working the fine adjustment by a HOOKE's joint. ABBE Condenser (see p. 47) with iris diaphragm and ordinary lens system of 1.20 num. apert. which is fitted to the apparatus by a sliding jacket. For projecting a sharp image of the flame in the plane of the object, an achromatic centering condenser of 1.0 num. apert. with iris diaphragm between the lenses, is made to fit the sliding jacket in place of the condenser of 1.20 num. apert. **(See special catalogue of apparatus for photo-micrography and projection.)** The achromatic condenser is of course available for ordinary purposes, except when oblique illumination is required. (Fig. 10.) The mechanical stage of the above stand is constructed for imparting a very slow motion to the object, which the projection of a magnified image at a great distance necessitates. Whilst the revolution of the object is effected in the ordinary way by rack and pinion, the cross motions are attained by fixing the rotating disk on slides at right angles to each other, which are acted upon by micrometer screws. Finder arrangement (reading to 0.10 mm) as in stand I[a]. (Fig. 6.) Without achromatic Condenser . . . . . 350.— With „ „ . . . . . 425.—	

Fig. 10. Stand for Photo-micrography.

B. Stands of Medium Size.

No.		Marks
7	**Stand II^{a}.** Stage with revolving vulcanite disk, which is centered by two milled-head screws acting against a spring in front; within small limits this can be used as a fine stage movement.	

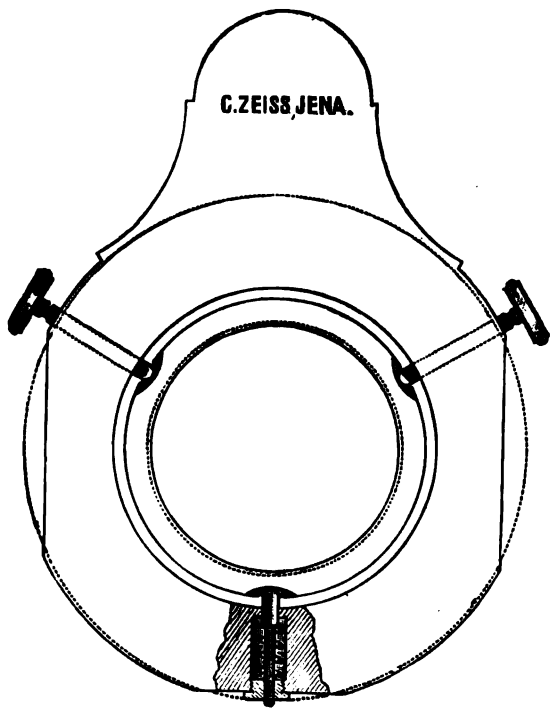


Fig. 11.
Stage with revolving disk and centering arrangements.

Coarse and fine adjustments as in the former instruments.

ABBE Condenser of new construction with iris diaphragm. Condenser 1.40 num. aper. Cylinder diaphragm to fit in place of the lens of the condenser. (Fig. 12.) . . . . . 290.—

Fig. 12. Stand II^{a}.

No.		*Marks*
8	**Stand IV[1].** Fixed stage. Coarse and fine adjustments as above. ABBE Condenser of 1.20 num. aper. Cylinder diaphragm to fit in place of the lens of the condenser. Without iris diaphragm, which however can be added at an extra charge of 15.— Mk., either on ordering or subsequently	**200.—**
9	**Stand IV[2].** Without condenser; this is replaced by the ordinary plane and concave mirror with universal motions and the ordinary cylinder diaphragm, which is connected with the under surface of the stage by a bayonet catch. This arrangement permits a rapid interchange of the diaphragm for the simplified ABBE condenser (condenser of 1.20 num. aper., with fixed iris diaphragm; page 49)	**150.—**
	With this illuminating apparatus No. 18 . .	**190.—**

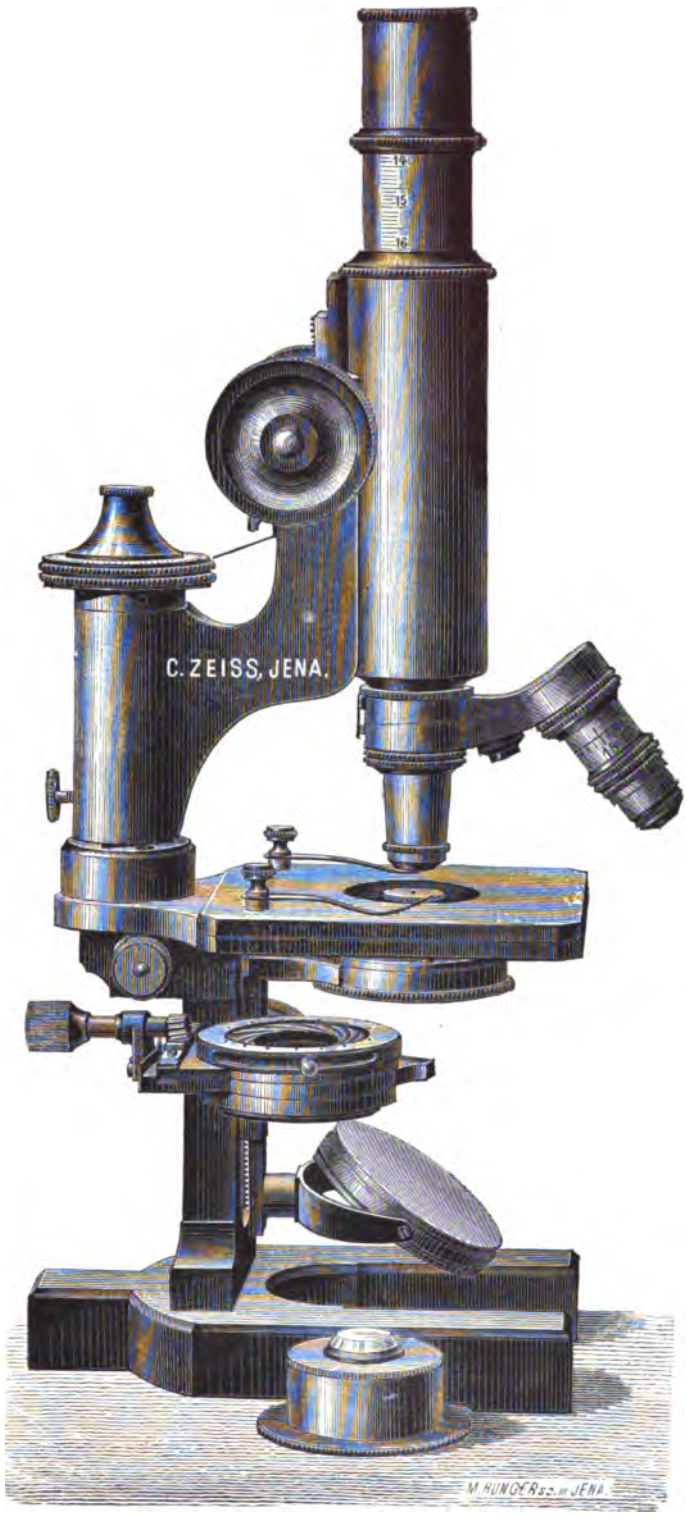


Fig. 18. Stand IV[1].

No.		*Marks*
10	**Stand V[1].** Fixed stage. Coarse adjustment by sliding tube. Fine ditto by micrometer movement of new construction. ABBE Condenser as in stand IV. (Fig. 14.)	120.—
11	**Stand V[2].** As the above but without the ABBE condenser. Other arrangements as in stand IV[2]	95.—
	The new form of ABBE Condenser for stands IV[2] and V[2] is supplied at any subsequent time at the ordinary price; as now constructed it can be fitted to these instruments by any optician.	
12	**Babuchin Model Stand.** This instrument, made after the design of Prof. BABUCHIN of Moscow, is included in our own series as it possesses several novel features of practical value which cannot be combined in the ordinary form of stand. These are substantially as follows: 1. The ABBE Condenser is constructed in a manner resembling that adopted by NACHET. The lens system, mounted in a holder, is inserted from above into the carrier which can be screwed downwards and swung out to the left. It is also made to centre. By these means the lens is easily changed for another of different aperture, or for a cylinder diaphragm or polariser.	

Fig. 14. Stand V[1].

No.		Marks
	2. Below the condenser is a slot rotating about the optic axis, in which the iris diaphragm worked by rack and pinion is inserted; for oblique illumination this can be adjusted excentrically.	
	3. The condenser is moved in the optic axis, not, as is generally the case, by rack and pinion, but by a screw fitted to the under side of the stage on the left hand, which gives a slower and more delicate motion. When the screw has been turned until the condenser has reached the lowest point, a further turn of the screw causes it to turn out automatically to the left, in which position the system can be changed, centered and so forth.	
	A specially large mirror fixed to a sliding holder allows plenty of up and down movement, and, when the condenser is swung outward, can be placed in any oblique position.	
	The stage, which is not made to rotate or move, is sufficiently large to take cultivation plates.	
	The upper part of the stand is attached by a hinge joint to a prism-shaped pillar sliding in an outer tube, so that it can be withdrawn and fixed by a clamping screw. This arrangement permits: 1. to give a compact form to the instrument, 2. to increase the height of the stage and stand generally, should this be required for the application of a photographic camera, or a larger substage &c.	
	The height of the stand may be thus varied from a minimum of about 200 mm, with a body-length of 150 mm, to a maximum of 230 mm; that of the stage from 105 to 135 mm. — This stand is fitted with the new micrometer fine adjustment. (Fig. 15.)	285.

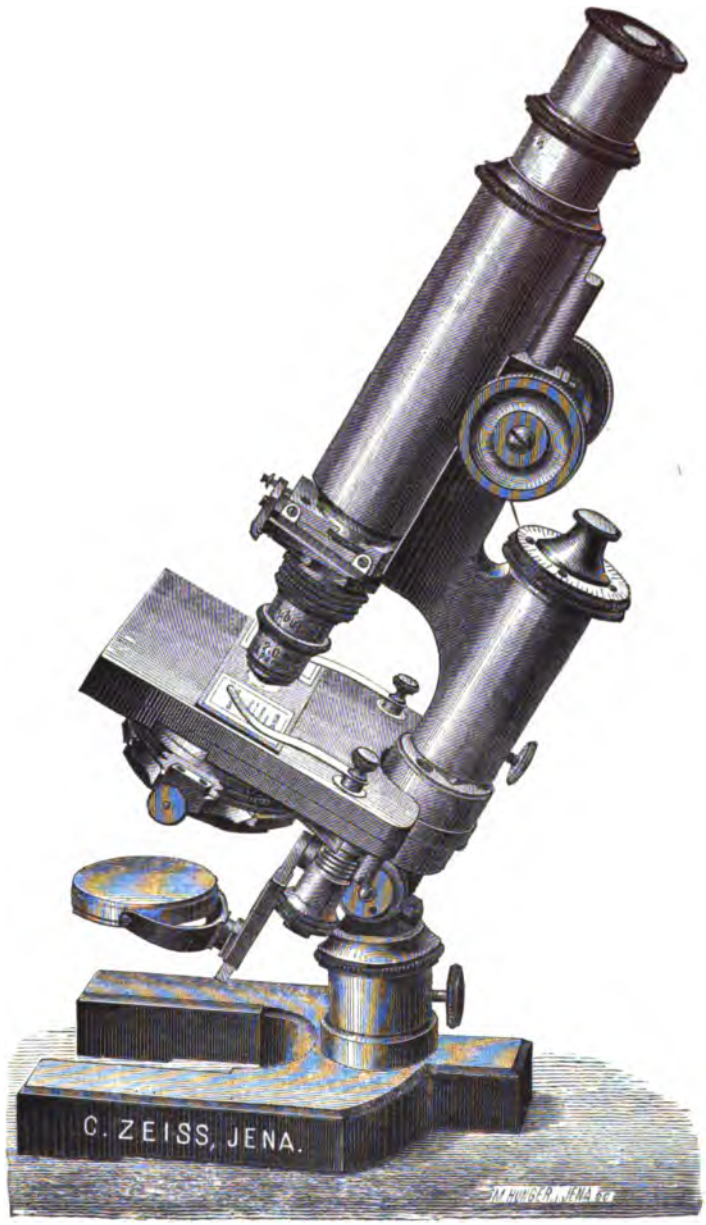


Fig. 15.
Babuchin model stand.

C. Small Stands.

Stands V^b, VII^b and VIII of former catologues will only be supplied to special order and provided also that not less than 10 be taken.

No.		*Marks*
13	**Stand VI.** Fixed stage. Illumination by plane and concave mirrors with universal motion in and out of the optic axis. Cylinder diaphragm with jacket fitted to the under surface of the stage by a bayonet catch, easily removed when very oblique light is required. This arrangement also permits the application of the illuminator No. 19 (of about 1.10 num. aper.) in place of the diaphragm, when objectives of larger aperture are in use. Coarse adjustment by sliding tube. Body provided with draw-tube. Fine adjustment by micrometer screw of new construction. This stand is made to incline. (Fig. 16.)	**65.—**
14	**Stand VII.** In all respects as stand VI but non inclinable. Rather stoutly built for laboratory use, but the strongest objectives are available on account of the fine quality of the micrometer movement (Illuminator No. 19 as in stand VI). (Fig. 17.)	**60.—**

Fig. 16. Stand VI.

Fig. 17. Stand VII.

No.		Marks
15	**Stand IX.** Simple stand for laboratory and technical purposes. Large plain stage with large aperture, which may be decreased if required by dropping in a diaphragm. Large plane and concave mirrors. Adjustment by rack and pinion, the construction of which permits the use of medium powers (C, D). (Fig. 19.)	30.—
	Recommended by Prof. JOHNE (Veterinary school, Dresden) for the detection of Trichina.	
16	**Hand or Demonstration Microscope.** Stage with clips to hold the specimen; sliding body, which after adjustment is securely fixed by a clamping ring. Fine adjustment if required	

Fig. 18.
Hand or demonstration microscope.

	to made by the tube carrying the eye-piece. In use it is directed by hand towards a window or lamp. Available even with objective D. Without objective, eye-piece and case. (Fig. 18.) . .	15.—

Fig. 19. Stand IX.

Illuminating Apparatus.

A. For white light.

No.		Marks
17	***Illuminating Apparatus after ABBE** (new arrangement). The essential feature of this is a condenser system of very short focus, which collects the light reflected by the mirror into a cone of rays of very large aperture and projects it on the object. The full aperture of the illuminating cone is only used when observing finely granular and deeply stained particles (bacteria) with objectives of large aperture. In every other case the cone must be reduced to suitable dimensions either by an iris diaphragm (see below) or common diaphragm (central illumination). On placing the diaphragm excentrically, by means of the rack work attached to the carrier, the central rays are excluded and a certain portion of the extra-axial cone falls upon the object (oblique light). When the diaphragm is thus excentrically placed this oblique pencil can be directed from all azimuths by rotating the carrier round the optic axis. The central stop diaphragm shuts off all the axial and transmits only the marginal rays (dark-ground illumination).	

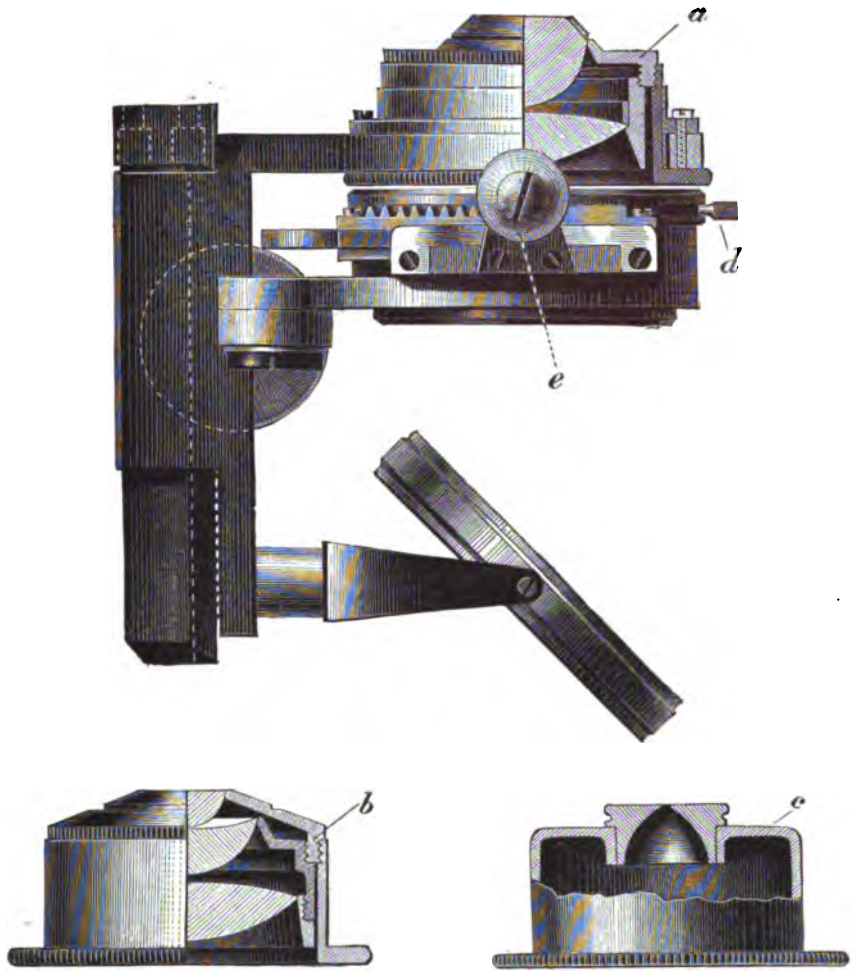


Fig. 20.

Illuminating apparatus after Abbe.

a) Condenser system of 1.2 num. aper., *b*) condenser system of 1.4 num. aper., *c*) cylinder diaphragm, *d*) iris diaphragm, *e*) adjustment for throwing the diaphragms out of centre.

No.		*Marks*
	The ***Condenser system** — made as before in two forms, a double combination of 1.20 num. aper., **price Mk. 20.—**, and a triple ditto of 1.40 num. aper., **price Mk. 25.—**, — is mounted in a holder which fits a sprung jacket on the apparatus. This arrangement facilitates an interchange of the two condenser systems, and also serves to carry the following apparatus when the lens is removed:	
	a) the ordinary cylinder diaphragm; this is included with every condenser;	

No.

Marks

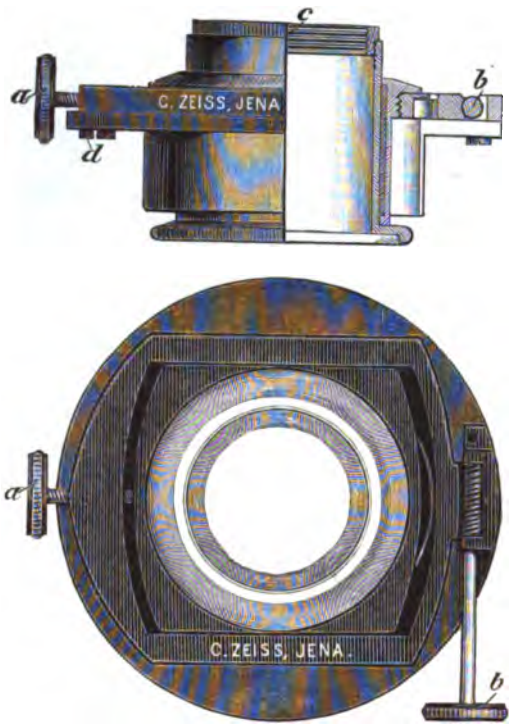


Fig. 21.
Arrangement for centering.

b) the illuminating appliances described under No. 20—23.

c) centering arrangement for accurately adjusting the above. (Fig. 21.) (**Price Mk. 20.—**.)

As most of these appliances require adjustment to the plane of the object a rack and pinion motion in the optic axis has now been fitted to the ABBE Condenser, so that every microscope provided with this accessory is capable of taking any other form of illuminator which may be required.

Fig. 22. Iris diaphragm.

The new iris diaphragm (price **Mk. 15.—**) is a very convenient substitute for the ordinary interchangeable diaphragms, as it affords a ready means of

No.		Marks
	increasing or diminishing the aperture with the greatest precision. Smallest aperture about 0.5 mm, largest — in the newest form — equal to the full aperture of the condenser system, so that it may remain in situ when either the central spot diaphragm or polariser is in use	55.—
18	***Simplified Illuminating Apparatus** for stands IV^a and V^a. Condenser system of 1.20 num. aper., with iris diaphragm (not adjustable excentrically); giving therefore central illumination in any degree but not oblique. Fitted to the under side of the stage in these instruments by a bayonet catch exactly as the cylinder diaphragm	40.—
19	***Illuminating apparatus** for stands VI and VII. Condenser of 1.0 num. aper., to fit in place of the cylinder diaphragm. Without diaphragms. The graduation of the (central) illuminating cone is effected by sliding the system in its jacket	10.—
	Numbers 18 and 19 may be ordered at any time by possessors of the corresponding stands, as they are made to fit these without any alteration.	
20	**Achromatic Condenser.** Specially constructed for the requirements of photo-micrography, to project a sharp image of the source of light in the plane of the object (see special catalogue for photo-micrography). Achromatic condenser of 1.0 num. aper. with iris diaphragm and centering adjustment. Made to fit the jacket of the ABBE apparatus in place of the ordinary system (see No. 17). Focussed by the rack and pinion motion of the illuminator	75.—

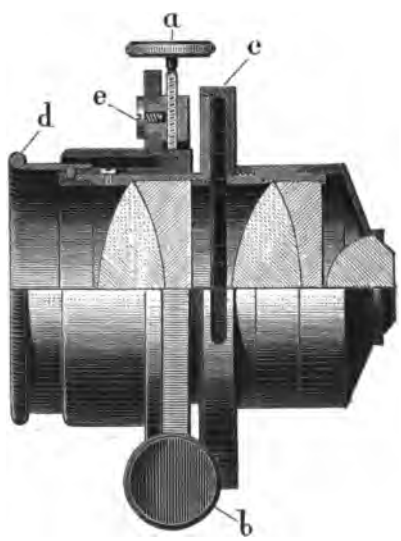


Fig. 23. Achromatic Condenser.

B. Illuminating apparatus for spectroscopially decomposed light.

No.		*Marks*
	When it is required to illuminate a portion of an object in the field of the microscope with a single pure spectral colour, or to observe the effect of the whole spectrum upon it, or finally to bring into action the spectrum of polarised light, the use of such appliances as Nos. 21, 22 and 23 is necessary. These are connected to the ABBE illuminator by the centering arrangement shown on page 48 and adjusted to the object plane by the rack and pinion motion.	

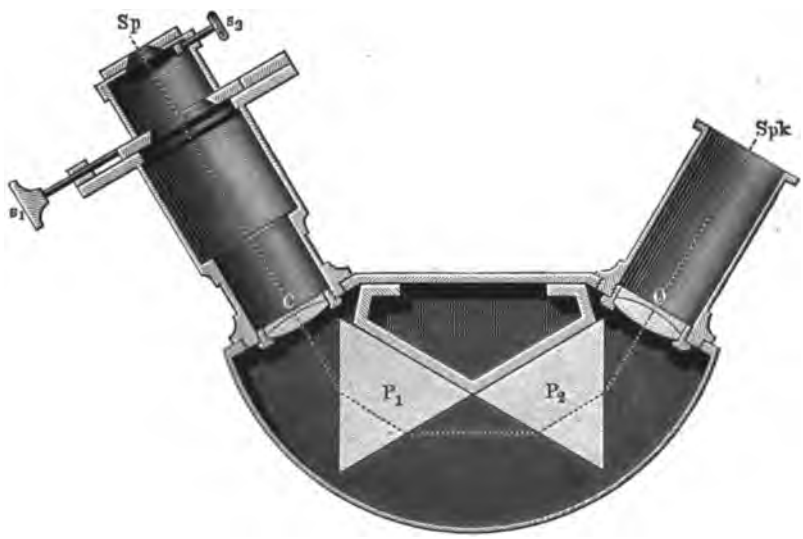


Fig. 24.
Illuminating apparatus for monochromatic light.

21	**Illuminating Apparatus for monochromatic light, after HARTNACK.** A spectrum of considerable length is projected on the specimen by means of a series of prisms of great dispersion,	

No.		Marks
	so that with rather high magnifications the whole visual field is illuminated by approximately monochromatic light. On shifting the slit by means of a screw the different colours are successively made to occupy the field of vision	80.—

Fig. 25.
Micro-spectral objective after ENGELMANN.

22 **Micro-spectral Objective after ENGELMANN,** for observing and measuring the effect of the colours of the spectrum on microscopical objects (Bot. Zeitung 1882 No. 26; PFLÜGER's Archiv Bd. XXVII p. 464, Bd. XXIX p. 415). Slit mechanism, collimator lens, AMICI prism and projection objective are combined in a tube about 77 mm in length, which fits below the stage concentrically with the axis of the microscope so as to project a real spectrum upon the preparation under observation. The edges of the slit are moved symmetrically by a screw with two reversed threads, so that the middle of the slit remains unaltered in position; the divided head of the screw shows the width of the slit as adjusted in 100ths of a mm; the length of the slit may be shortened on both sides by two slides acted upon by screws. — Ordinary objectives are used for projecting the spectrum,

No.		*Marks*
	either A, B, C or D according to the desired size of the spectrum, and which screw by the narrow gauge thread on the lens mounts over the AMICI prism. (Fig. 25.)	124.—
23	***Spectro-Polariser after ROLLETT** (Zeitschrift für Instrumentenkunde, Jahrg. I, p. 366) as modified by DIPPEL, for determining the character of double refraction in microscopical specimens. Combination of two flint-glass prisms, giving a deviation of 90°, having on one side a moveable slit and collimator and on the other a microscope objective, which projects from below a real spectrum on the specimen under observation. Scale tube on the box containing the prisms, with mirror, collimator-lens, and a scale divided and numbered according to the wave lengths (as in the spectroscopic eye-piece No. 53); by reflexion from one surface of the prism a real image of this scale is projected with the spectrum in the plane of adjustment. The edges of the slit are moved symmetrically by a double threaded screw so that the middle of the slit always occupies the same position. A PRAZMOWSKI prism mounted on a revolving arm in front of the slit serves as a polariser, and between it and the slit is a revolving ring to receive selenite films for producing interference lines in the spectrum. An A, B, C or D objective is used to project a spectrum of the desired dimension and is screwed to the box containing the prisms by the narrow gauge thread on the lens mount. The apparatus is arranged for connection with the framework of the ABBE Condenser by means of the centering adjustment (p. 48). The vertical motion is made by rack and pinion but the shifting of the spectrum in the transverse plane is effected by two milled-head screws acting on double slides. (Fig. 26.) Including two selenite films for red of the second and third order	240.—

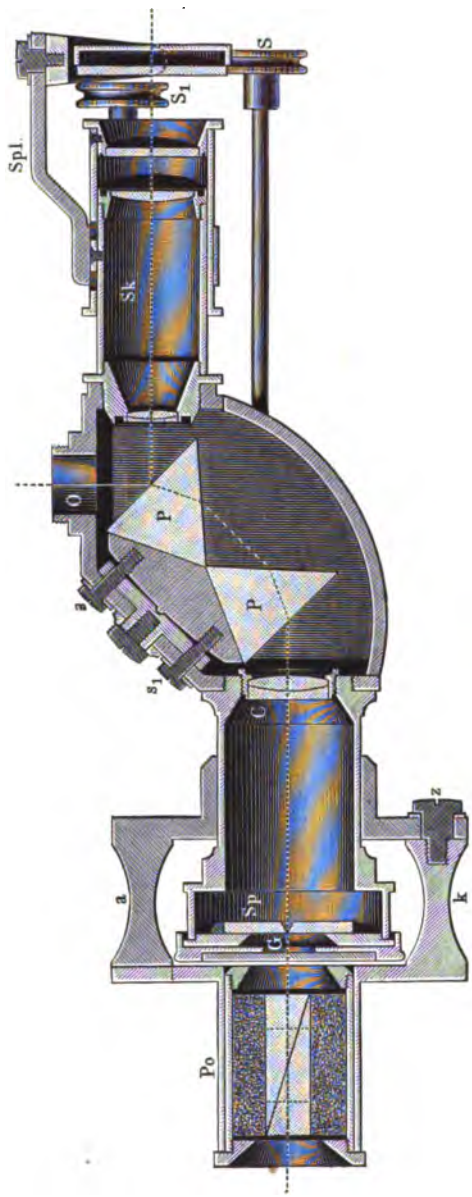


Fig. 26.
Spectro-Polariser.

Appliances for changing the Objectives on the Stand.

No.		*Marks*
	These contrivances are required to fulfil two conditions: 1) that the image should not disappear on changing the objectives, so that only a touch of the micrometer screw is necessary for perfect adjustment, and 2) that the centering should be good, i. e. that the same spot in the specimen remains in the field after changing the lens. The first condition is fulfilled by adjusting the lengths of the mounts, so that on changing them their focus lies at a correponding distance from the plane of the object. The second condition can only be guaranteed in the ordinary nose-piece when it is specially adjusted to the particular objectives intended for use with it. It is impossible therefore to be answerable for the exact centering of nose-pieces subsequently supplied. To avoid this inconvenience we have lately constructed the Sliding Objective-changer (see below) which has a special arrangement for centering and can therefore be adapted to any objective.	

No.		Marks
24	**Revolving Nose-pieces.**	
	a) Revolving nose-piece for 3 objectives. (Fig. 27.) . .	27.—

Fig. 27.

Fig. 28.

Revolver.

	b) Revolving nose-piece for 2 objectives. (Fig. 28.) . .	20.—
	The quadruple nose-piece is no longer made.	
25	***Sliding Objective-changer.** This apparatus possesses an arrangement by which each individual objective can be centered and it permits the use of any number of glasses. (Figs. 29 and 30.)	

It consists of:

a) **The tube-slide.** This is screwed on the end of the body like an ordinary nose-piece with the grooves directed anteriorly. The plane of the sliding motion is not made at right angles to the optic axis but inclined at a small angle to it.

b) **The objective-slide.** The plane of the slide is inclined to the axis at an angle corresponding to the tube-slide, so that the objective rises on its withdrawal and cannot damage the specimen. At one end of this fitting is a screw turned by a watch-key which acts as a stop to bring the objective always back to the same position and which also serves as a centering adjustment in the direction of the slide, while the adjustment in the transverse direction is effected by a similar screw working at right angles to the first.

Fig. 29.

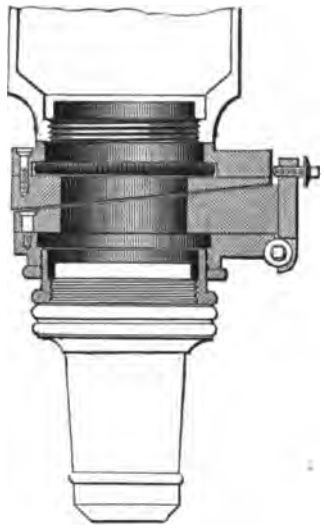


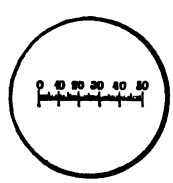
Fig. 30.

Sliding objective-changer.

No.		*Marks*
	Objectives whose settings are approximately compensated for their focal lengths can, by means of the clamping screw on the objectve-slide, be set once for all in their proper position. The two pieces fit one another accurately; any number is supplied with the tube-slide or subsequently as may be required.	
	On changing the objectives, if the slide has been properly adjusted, the same part of the object always occupies the field and so nearly in focus that only a slight adjustment by the micrometer screw is necessary.	
	Tube-slide	10.—
	Objective-slides, each	10.—

Apparatus for measuring and counting microscopical objects.

A. Measuring Apparatus.

No.		Marks
	With regard to measurement of the thickness of microscopical objects see p. 26.	
	The following apparatus is intended for measuring the length and breadth of microscopical objects.	
26	**Stage Micrometer.** One millimeter divided into 100 parts; on a glass slip, in case	10.—
	This serves merely as a standard of known value for adjustment of the measuring apparatus proper.	
	 **Fig. 31. Eye-piece micrometer.**	
27	**Eye-piece Micrometer.** Divisions on a glass disk to drop into the eye-piece; for measuring the magnified image of an	

No.		Marks
	object; the real value of the divisions therefore must be estimated by means of the stage micrometer for each objective and eye-piece combined. Approximate values, sufficiently accurate for ordinary purposes, are given in a table supplied with our micrometer eye-pieces. (Fig. 31.)	5.—
28	**Micrometer Eye-piece for ordinary objectives.** Huyghenian eye-piece (2 or 3 as desired) with sliding eye-lens for exact adjustment to the eye of the observer and table of values of the divisions. (Fig. 32.)	15.—

Fig. 32.
Micrometer eye-piece.

29	**Micrometer Eye-piece for the apochromatic objectives.** **Compensating eye-piece 6 with $^1/_1$ micron divisions.** The divisions in this eye-piece are so computed that the value of one interval (with a body-length of 160 mm) for each apochromatic objective equals just as many micra, μ, (0.001 mm), as its own focus equals millimeters, e. g.	
	Apochromat: 16.0 mm 8.0 mm 4.0 mm 3.0 mm 2.5 mm 2.0 mm 1 interval: 16 μ 8 μ 4 μ 3 μ 2.5 μ 2 μ.	
	A table of values is therefore superfluous for this eye-piece, as they are indicated by the designation of the objective in use	30.—

No.		Marks
30	**Screw Micrometer Eye-piece.** For more exact measurement of objects which occupy a large portion of the field. RAMSDEN eye-piece. Glass plate with crossed lines, which together with the eye-piece are carried across the image formed by the objective by the measuring screw, so that	

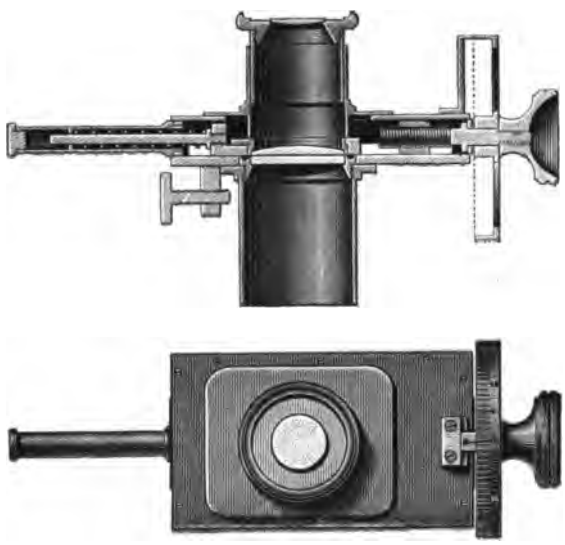


Fig. 33.
Screw micrometer eye-piece.

	the adjustment always remains in the centre of the ocular field. Each division on the drum corresponds to 0.002 mm. Whole turns are counted on a numbered scale seen in the visual field. Measures the image projected by the objective up to 8 mm. (Fig. 33.)	60.—
31	**Stage Screw Micrometer,** for the exact measurement of objects too large to be included in one visual field. A revolving disc divided on the edge, for fixing the position of the object, supported on struts extending from the	

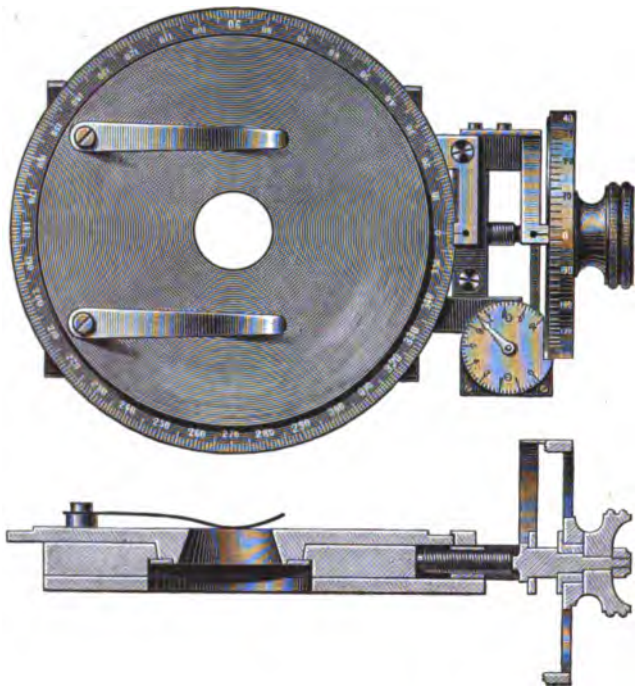


Fig. 34.
Stage screw micrometer.

No.		*Marks*
	frame of the micrometer screw. The divisions on the drum read off to 0.002 mm; whole turns of the screw are indicated on a dial. The screw measures up to 10 mm. Arranged to fix on the stage of the larger stands	120.—

B. Apparatus for Counting.

32	**Crossed-line Micrometer,** for dropping into the eye-piece. A square of 5 mm divided either into whole or half mm according to order; for counting scattered particles in the visual field . .	5.—
33	**Crossed-line Stage Micrometer** with chamber 0.100 mm in depth. The bottom is divided into 400 squares each equal to $^1/_{400}$ sq. mm; the cubic contents of the fluid resting on one	

No.		Marks
	square, when the chamber is full, therefore equals $^1/_{4000}$ cubic mm. With 2 plane cover-glasses. In case	15.—
34	**Apparatus for counting blood corpuscles** after THOMA. The above crossed-line micrometer with an exactly caliberated mixer for diluting the blood to a fixed amount. With method of use. In case	30.—
35	**The same,** with a small moveable stage, enabling the divided surface of the chamber to be moved across the visual field by a screw	40.—
	C. Measuring Apparatus for various other purposes.	
36	**Brass measure,** 100 mm, with chamfered edge	1.50
37	**Measures on plate glass,** for drawings, in which the divisions lie on the surface of the paper without parallax, with fine, sharply engraved lines:	
	300 mm glass rule, divided to single mm	9.—
	200 mm do. do.	5.—
	100 mm on glass slip 125 × 25 mm	1.50
	50 mm divided to half mm on a 3 × 1 inch slip	1.50
38	**The two latter with double divisions,** English inches and lines, or half lines, and mm; each	2.50
39	**Fully divided Circles** on plate glass discs, with centre marks, for use as transposers:	
	Circle 80 mm in diameter, entire degrees	5.—
	Circle 120 mm in diameter, half degrees	9.—

No.		Marks
40	**Goniometer Eye-piece** (No. 2), for estimating the angles of microscopical objects, with divided circle and glass plate marked with a series of parallel lines; sliding adjustment to eye-lens . .	30.—
41	**Cover-glass Tester,** for the exact measurement of cover-glasses, thin plates etc. The measurement is effected by a clip projecting from a box; the reading is given by an indicator moving over a divided circle on the lid of the box. The divisions show hundredths of a millimeter. Measures to upwards of 5 mm	36.—

Fig. 35.
Cover-glass tester. Nr. 41.

42	**Cover-glass Tester** of more simple construction; screw with divided disc and arrangement to regulate the zero-point. Also gives measurements to 0.01 mm	12.—

Drawing Apparatus.

No.		*Marks*
43	***Camera lucida after ABBE.** The drawing surface is made visible by a double reflection, from a large plane mirror and from the silvered surface of a small prism in the eye-point of the eye-piece. The microscopic image is seen directly through an aperture in the silvering of the prism. By the concentricity thus obtained of the bundle of rays reaching the eye from both the microscope and the paper, the image and pencil are seen coincidently without any straining of the eyes. With this apparatus moreover drawings may be executed on a horizontal surface without perceptible distortion. The brightness of the paper is regulated by smoke-tinted glasses which fit into the prism	

Fig. 36.
Camera lucida after Abbe.

No.		Marks
	mounting. The apparatus is adjusted for the No. 2 Huyghenian and the compensating eye-pieces 4, 6 but can also be used with the + 6 aplanatic lens on the large dissecting stands I, II and III when mounted on a special fitting. (Fig. 36.)	30.—
44	Whilst recommending the Camera described above as being more handy, we make to order another form with larger mirror and longer arm, which quite obviates any distortion of the drawing	36.—

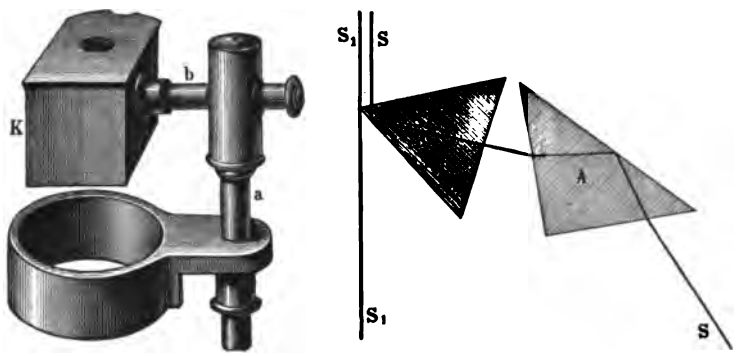


Fig. 37.
Camera lucida.

45	**Camera lucida** with two prisms; for fixing over the eye-piece. (Fig. 37.)	21.—

Camera lucida after ABBE, Nos 43 and 44, so arranged that the prism case together with the mirror may be swung back round a horizontal pivot, or, if desirable, withdrawn altogether, the underpart remaining meanwhile on the tube in its adjusted position.

Add M. 10.— to the prices quoted for Nos 43 and 44.

Arrangements for Polarisation.

No.		*Marks*
46	**Polarisers:**	
	I. For use with the illuminating apparatus of the large stands. NICOL prism with disc on the mounting to fit the carrier of the condenser, so that the ordinary diaphragms and also selenite and mica films may be placed over the polarising prism.	15.—

Fig. 38.
Polariser Nr. 46 I.

	II. To fit the cylinder diaphragm of the smaller stands. NICOL prism with condensing lens	18.—

No.		*Marks*
47	**Analysers:**	
	I. PRAZMOWSKI prism in brass mount for placing above the eye-piece	16.—
	II. The same with divided circle	31.—
48	**Complete Polariscopes for the larger stands** (with ABBE condenser).	
	a) Polariser I and Analyser II (with divided circle) . . .	46.—
	b) „ I „ „ I (without divided circle) . .	31.—
49	**Complete Polariscopes for the smaller stands** (without condenser).	
	a) Polariser II and Analyser II (with divided circle) . . .	49.—
	b) „ II „ „ I (without divided circle) . .	34.—
50	 Fig. 39. Axial images eye-piece. **Eye-piece for observation of axial images.** For use with Polariser I and Analyser II. Huyghenian eye-piece 2 with sliding eye-lens combined with a collective system made up of two simple lenses, which is adjustable to the upper focal plane of the objective by a sliding tube. (Fig. 39.)	30.—
51	**Series** of 8 selenite and mica films after MOHL	10.—
	Possessors of the Goniometer eye-piece No. 40 can use the divided circle thereof for the analyser as well. The price of the polarising arrangement in this case therefore must be reckoned minus this item.	
	Spectro-polariser, see No. 23.	

Spectroscopic Eye-pieces.

No.		*Marks*
52	**Spectroscopic Eye-piece.** Eye-piece with slit mechanism between the lenses. The upper achromatic lens adjustable to the slit. AMICI prism to place over the eye-piece. The whole connected with the body by a clamping screw	72.—
53	***Spectroscopic Eye-piece (Micro-spectroscope) after ABBE.** Achromatic upper lens adjustable to the slit as above. Mechanism between the lenses for contracting and expanding the slit by symmetrical movement of the edges (after MERZ) (worked by the screw *F*); this opens so widely as to permit a view of the whole visual field. The slit is shortened by the screw *H*, so that when the comparison prism is inserted the aperture is contracted to such an extent, that the image of the object under investigation completely fills ist. Comparison prism with lateral frame and clips to hold the compared object and the mirror. All these parts in a drum combined with the eye-piece. Above the eye-piece an AMICI prism of great dispersion, which turns aside on a pivot (*K*) to allow of the adjustment of the object; the axial position of the prism is indicated by the spring catch *L* which keeps it in place. A scale is projected on the spectrum by means of a scale-tube and mirror attached to the mount of the prism; the divisions of the scale give the wavelengths	

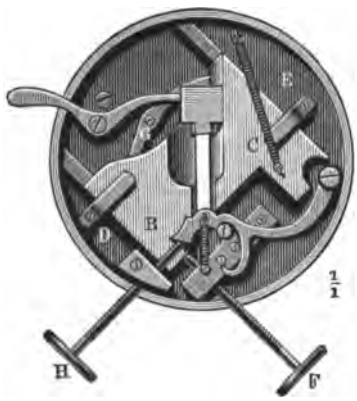


Fig. 40.

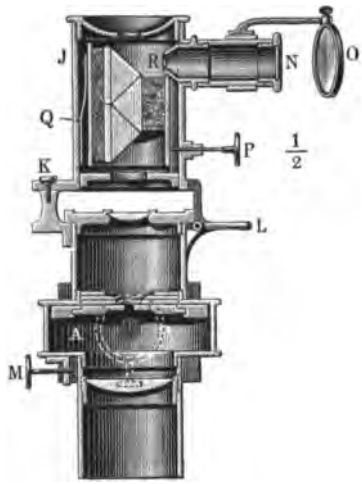


Fig. 41.

Micro-spectroscope after Abbe.

No.		*Marks*
	of that section of the spectrum on which they fall in fractions of a micron. The screw *P* is for adjusting the scale relative to the spectrum. In case, including a number of lithographed scales for recording observations. (Figs. 40 and 41.)	165.—
54	* **Micro-spectrometer after ENGELMANN.** Constructed on the principle of VIERORDT's spectro-photometer for quantitative microspectral analysis. In place of the eye-piece the box *A* is attached to the body of the microscope by the tube *R*; it contains two independent, conaxial, moveable slits in juxtaposition, which are symmetrically opened and closed by opposed reverse-threaded screws. The width of each slit is read off on the drums *T* and *T'* accurately to 0.01 mm and by estimation to 0.001 mm. One slit is occupied by the image of the object under investigation and the other by light from the source of comparison, which is brought to it by a superimposed reflecting prism and lateral tube *d* with collimator lens, diaphragm carrier *n* and mirror *S*, or incandescent lamp. In the upper opening of the box *A* is placed either an eye-piece in a sliding jacket, which is accurately adjusted to the slit, or instead of this (after proper adjustment of the image of the	

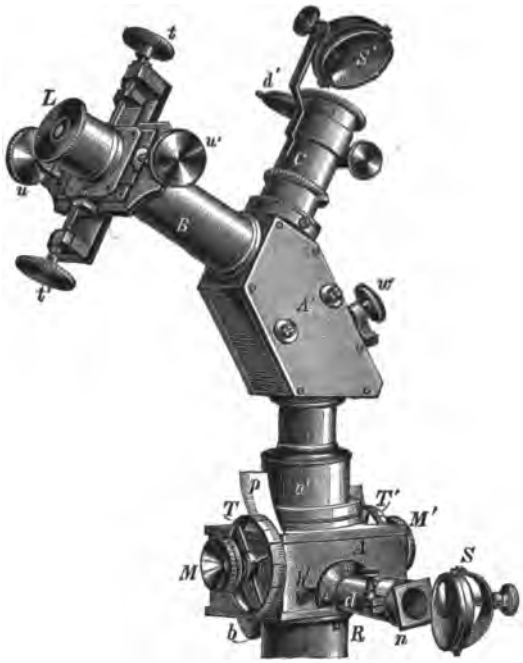


Fig. 42.

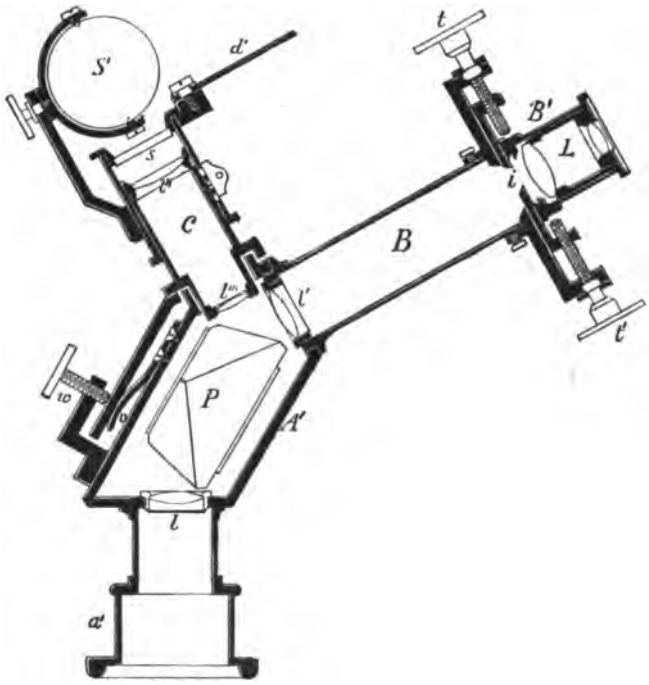


Fig. 43.
Micro-spectrometer after Engelmann.

No.		Marks
	specimen in the objective slit) the spectroscopic apparatus *a' A' B C*, which is fixed in the proper azimuth by an arresting mechanism. This apparatus consists of the box *A'* which on one side, the upper end of *a'*, contains a collimator lens *l*, to render parallel the cone of rays proceeding from the objective before they fall on a RUTHERFORD prism *P* of great dispersion. By the lens *l'* on the other side, at the lower end of *B*, the parallel rays proceeding from the prism are again brought to a focus and this real spectrum is observed by an eye-piece *L*. By two slit mechanisms at right angles to one another, actuated by the screws *t t'*, *u u'* in the focal plane of the eye-piece, the visual field can be limited at pleasure according to the procedure of VIERORDT.	
	By means of two lenses shown at *C*, an image of a wavelength scale is projected on the spectrum by reflexion from the end-surface of the AMICI prism, which is illuminated by the mirror *S'* and put out of action by closing the shutter *d'*. Adjustment of this scale is made by inclining the whole scale-tube *C* with the screw *w*, which is opposed by a counter spring *v*. (Figs. 42 and 43.)	480.—

Various Optical and Mechanical Apparatus.

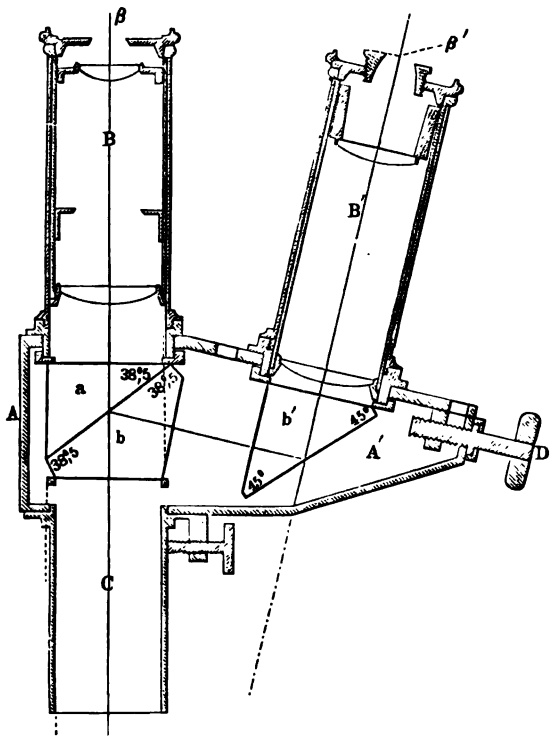


Fig. 44.
Stereoscopic eye-piece.

No.		*Marks*
55	***Stereoscopic Eye-piece after ABBE,** for stereoscopic and binocular observation of microscopical objects with any degree	

No.		Marks
	of high magnification. (Zeitschrift für Mikroskopie, Jahrg. 1880, p. 207; CARL's Repertorium d. Experimentalphysik, Jahrg. 1881, p. 298; Journ. of the R. Micr. Soc. 1881, p. 203.) — The division of the bundle of rays proceeding from the objective to produce two separated images, takes place at the upper end of the body by partial reflexion from a thin stratum of air between two juxtaposed glass prisms. The direct rays proceed to an eye-piece in the axis of the body, the divergent undergo another reflexion through a prism in a second eye-piece placed excentrically, so that its axis forms an angle of 14° with that of the body. Both eye-pieces give images of equal magnification. The excentric eye-piece is adjustable by a screw to the inter-ocular width of the observer. Bisection of the ray bundles for producing stereoscopic effects is made by adjustable semi-diaphragms above the eye-pieces; without these the apparatus gives binocular non-stereoscopic vision. Available with low or high powers on any of the larger stands provided with rackwork coarse adjustment and which permit of the body being shortened to at least 160 mm. (Fig. 29.) In case . . .	150.—
	In ordering this binocular apparatus for any microscope it will be sufficient to send a sharp sealing-wax impression of the upper end of the body.	
56	**Reversing Prism after NACHET** (prisme redresseur), for obtaining erect images in dissecting with the compound microscope. With plate mount to fix above No. 2 eye-piece	18.—
57	***Diffraction Plate after ABBE**, for demonstration of the effects of refraction on the formation of microscopical images (Zeitschrift f. Mikroskopie, II. Jahrgang, Heft 2; Monthly Micr. Journ., Febr. 1877). — Three cover-glasses silvered on their under surface with traced groups of parallel and crossed lines, cemented on a glass slip; in case	7.—

No.		Marks
58	***The same,** with a set of diaphragms and an arrangement for placing and revolving the same above the objective, designed for objective aa	12.—
59	**Bulls-Eye Lens** 100 mm in diameter, on stand; in case .	50.—
60	**Ditto** 80 mm	36.—
61	**Ditto** 60 mm	27.—
62	**Microscope Lamp.** Gas lamp of special construction on brass stand with vertical adjustment, combined with a glass globe which is filled with water or ammonio-cupric solution to act as a condenser. To obtain a proper illumination the gas flame should be about 15 cm behind the globe and the mirror of the microscope the same distance in front of it with the most concentrated part of the cone of rays impinging on it. The lamp gives an excellent bright and white light which almost completely supplies the place of good daylight	35.—
63	**Hand Spectroscope** (Pocket Spectroscope) **after BROWNING,** for observing the effect of absorption in larger objects — with adjustable slit and AMICI prism of high dispersion.	
	a) Without Comparison prism	30.—
	b) With Comparison prism	40.—
64	**Saccharimeter,** for estimating the percentage of sugar in fluids. With tube for liquids 200 mm long made to slide in a brass tube, which carries a polariser and double quartz plate at	

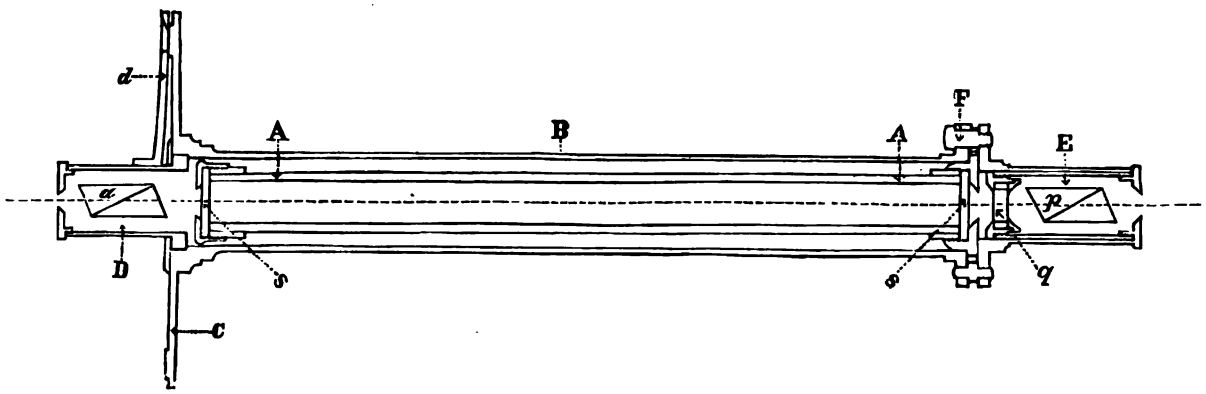


Fig. 45.
Saccharimeter.

No.		*Mark*
	one end and at the other an analyser with divided circle. The circle is divided to semi-degrees and tenths can be estimated with accuracy. Observation is made by adjusting the so-called transition colour on both halves of the quartz plate, the tube being directed by hand towards a white surface. Only intended for fluids containing a small percentage of sugar. With method of use	65.—
65	**Heating Arrangement** for warming microscopical objects during observation. After PFEIFFER. The arrangements hitherto used for this purpose leave the observer in doubt, as to whether the temperature to which the object is raised, really corresponds to that indicated by the thermometer. The present arrangement affords full security on this point, as it permits of the object, together with the stand and the surrounding air being brought up to and maintained at a certain temperature. It consists of a mahogany box enclosing the whole stand in a nearly air-tight manner; in the anterior wall is a glass window to permit the necessary incident light; on both sides are closely fitting doors to enable the specimen being moved by the hands. The whole affair stands on a thick metal plate and tripod. This	

Fig. 46.
Heating arrangement.

No.		*Marks*
	is heated from below by a gas-burner regulated by a thermostat. The temperature inside the box is controlled by a thermometer and may be raised up to 45° C. without damage to either stand or objective. (Fig. 46.)	
	a) For large stands	70.—
	b) For medium stands	60.—
66	**Turn Table** on wood base, for making varnish rings . . .	9.—

Apparatus for Photo-micrography*.

Large photo-micrographic Apparatus.

The chief constituents of this apparatus are as usual, Microscope and Camera. Instead however of being combined on a single supporting board, each

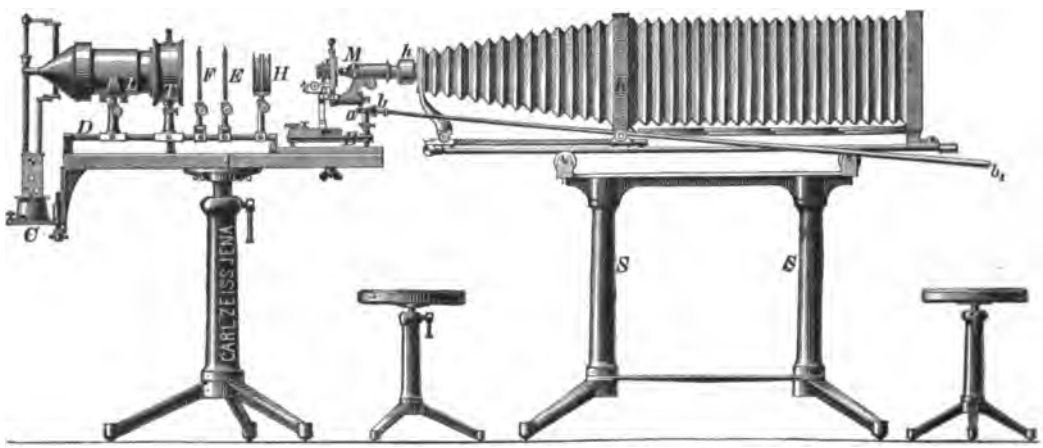


Fig. 47.
Large photo-micrographic apparatus.

with its own accessories is mounted on a separate stand and they are only connected when the picture is being taken. This arrangement was chosen: 1. in order to enable the necessary manipulations with the microscope being carried

*) A special catalogue is issued for photo-micrographic apparatus. (**Price Mk. 3.**)

on in a sitting position, instead of the bent and inconvenient posture which the ordinary mounting imposes; 2. to render the apparatus without the camera available for projection. Whilst the separation of the two parts possesses these advantages, they are capable of being connected by the light-excluding arrangement described further on and, from the camera moving on runners, this light-tight connection is effected in the easiest and most rapid manner.

Either of the larger inclining stands supplied by the firm is suitable for many of the purposes concerned, but **the stand for photo-micrography** Fig. 10 is specially designed for the requirements of this branch. It is set up on a **microscope table** *A* (Fig. 48), adjustable vertically on a firm cast-iron pillar; on the end which is directed to the camera is fitted a metal plate *B*, levelled by three screws, to carry the instrument and at the other an angle plate *C* to support an arc lamp. The space intervening between the stand and the lamp is occupied by a so-called optical bench *D*.

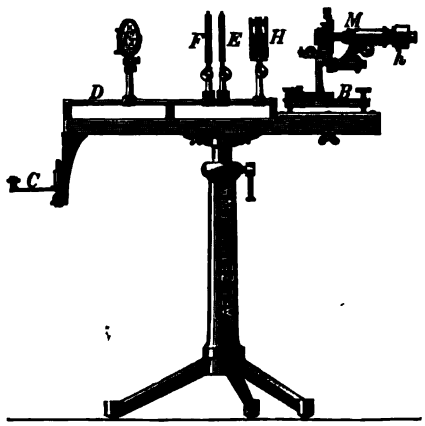


Fig. 48.
Microscope table for photography.

This is intended to carry the following illuminating accessories: for use with sunlight are two diaphragm carriers *E*, *F*, adjustable vertically by rack and pinion; they can be rapidly turned aside on a hinge and when replaced a stop ensures exact coincidence with their former position (they are also used to hold a ground-glass screen, which serves as the source of light with low magnifications); a plane mirror *G* with coarse and fine adjustments in both horizontal and vertical axis, to compensate the small irregularities in the motion of the heliostat, and a holder *H*, also adjustable vertically by rack and pinion, for taking absorption cells.

For use with the electric arc lamp, as shown in Fig. 47, beside the above is a water chamber *T*, with plate-glass walls for absorbing the heat rays and a collective system *L* for projecting the image of the carbon points on the focussing screen.

On the metal support *B* (Fig. 47) is a removable fitting *a* which carries over the motion of a HOOKE's joint bb_1, worked from the camera end, to the geared head of the fine adjustment of the microscope. The body of the latter is provided with a double jacket *h*, into which slides a piece of tube at

the microscope end of the camera when this is rolled forwards and which forms a very perfect light excluding fitting without actual contact between the two.

As before mentioned, **the camera for photo-micrography** *K* is separated from the microscope and like it is mounted on a light but firm cast-iron support *SS* with rollers on which it runs easily and without jerk. The total length of the bellows is 1.5 m; by shortening it is available for any lesser distance of image. With the intention of enabling fluid preparations (pure cultures &c) to be photographed the camera has been divided into two halves, that next the microscope being capable of elevation and fixture either perpendicularly, as shown in Fig. 49, or in any intermediate position. Motion of the image plane is effected by a strong racked stay, on which the microscope end of the camera also moves.

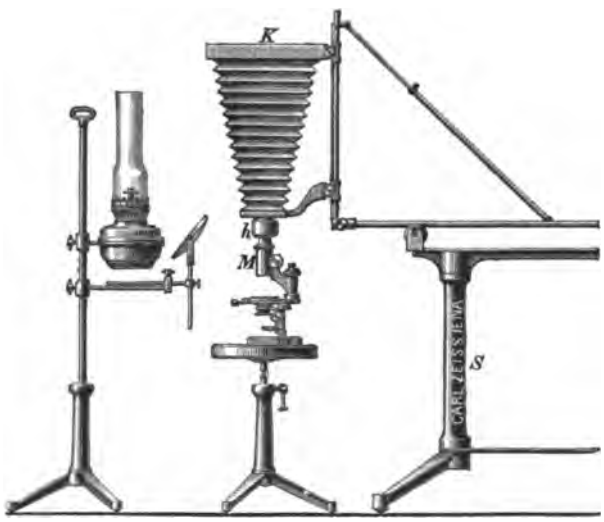


Fig. 49.

This as before carries the light excluding fitting, which is attached to a removable slide so that it can easily be changed for a macroscopic photographic lens, thus making the camera available for ordinary photographic work.

Both halves of the camera are made to take sliding backs giving a picture 24 × 24 cm, but by putting in frames any smaller sized plates may be used.

Two focussing screens complete the arrangement, one of these is a ground glass for superficial orientation of the picture, the other is transparent,

with a diamond cross on the side next the microscope and magnifier for the fine adjustment of the image. If desired another back is supplied of peculiar construction, which allows a number of impressions to be taken close together on a single plate, for ascertaining the best length of exposure. For this purpose the back is made to slide in a groove and, stopping as often as desired, is carried past a slit which allows only a slender strip of the image to fall on the sensitive plate, this however being quite sufficient upon which to form a judgement. Finally, the bellows can be slightly lifted off the back in order to inspect the picture from the front, the image being thrown upon white paper pasted on the slide (NACHET's method).

For the **optical equipment** of the photo-micrographic apparatus the apochromatic objectives and projection eye-pieces are specially recommended. The achromatic condenser (N°. 20), which projects a sharp image of the source of light on the object, is advised for the higher magnifications. For the 75 mm system a collective lens of long focus serves as a condenser, throwing an image of the light in the system.

With the electric light a collective lens-system is made use of, which differs from the ordinary combination for similar purposes in that it consists of 2 plano-convex and one concavo-convex lens. The part of the lens directed towards the carbon points, which collects the diverging into a bundle of parallel rays, and which is fixed once for all at the most suitable distance from the lamp, is a concave surface to diminish the spherical aberration. The part of the system directed to the microscope, which combines the parallel rays in an image, is mounted in a sliding jacket which permits a movement of the image in the optic axis within somewhat wide limits.

The 75 mm system is used without an eye-piece and inserted into the body from the upper end by a special fitting. The other objectives are either screwed on as usual, or attached to a revolving nose-piece, or use is made of the newly constructed objective-changers (N°. 25), which are very convenient for the present purpose.

No.		Marks
67	**Large photo-micrographic Apparatus.**	
	I. Stand for Photo-micrography with accessories.	
	Mikroscope stand, including ABBE Condenser	350.—
	Achromatic condenser with iris diaphragm and centering adjustment, to fit in place of the ordinary condenser system . .	75.—
	Centering adjustment alone, for using the ordinary objectives as condensers	20.—
	Small collective lens, to replace the condenser system, for use with the weakest objectives	5.—
	Metal support for the microscope, on three screws, with HOOKE's joint and arrangement for working the fine adjustment from the camera	30.—
	Microscope table with optical bench	100.—
	Equipment of the optical bench:	
	1. For sunlight.	
	Reflecting mirror	45.—
	2 Diaphragm carriers with diaphragms and ground-glass disc	52.—
	Trough holders with 2 cells	37.—
	2. For artificial light.	
	Electric arc lamp by SIEMENS and HALSKE, 1200 candle-power, including funnel and connecting piece (factory price) .	215.—
	Collective system for electric arc light	110.—
	Water chamber for absorbing the heat rays	47.—
	2 Diaphragm carriers **Trough holders** } as above.	
	3. For lamplight.	
	Convex lens on stand	36.—
	Transport	1122.—

No.	II. Camera for Photo-micrography with accessories.	Marks
	Transport	1122.—
	Camera, with iron stand, including 2 dark slides	195.—
	2 Stools on pillar with vertical adjustment	28.—
	Dark slide for making exposure scales	25.—
	Focussing lens	15.—
		263.—
		1385.—
	Extra dark slides, each	18.—

68	**Small Photo-micrographic Camera after Francotte.**

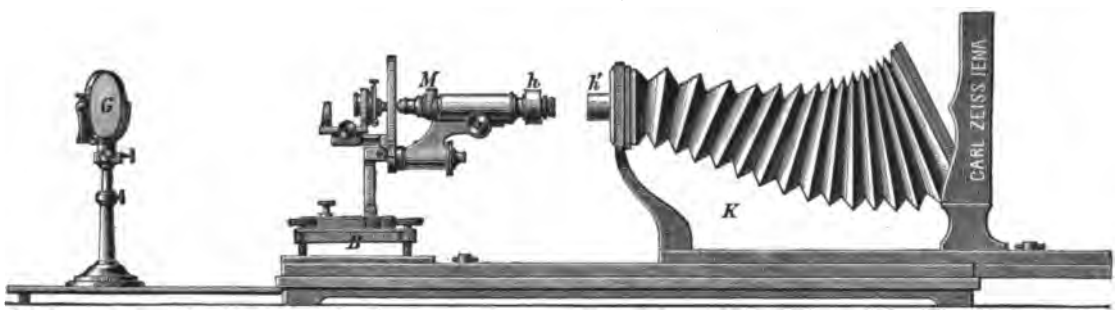


Fig. 50.
Small photo-micrographic camera after Francotte.

Bellows 60 cm in length, sliding on a stout board, for use with any inclining stand, including metal support (on 3 screws) for the stand, 2 dark slides (18 × 18 cm) ground-glass and transparent screens	70.—
Extra dark slides	12.—

Dissecting Microscopes and Magnifiers.

Dissecting Stands.

No.		Marks
69	**Dissecting Stand I** after PAUL MAYER. Heavy horse-shoe foot; the stage consists of a large metal frame (10 cm square) to which is attached conveniently folding wooden struts to support the hands; adjustment by rack and pinion, plane and concave mirrors with universal motions. For teasing out small objects on a slip or in a watch glass the double dissecting series No. 77 or the triple ditto No. 76 is made use of, carried in the ordinary lens holder, and in the above frame is placed a metal plate with stage opening of the usual size, which can be closed below by either a black or white disc as may be desired. For the observation of larger objects, particularly living aquatic animals, the aplanatic lenses Nos. 78 and 79 (× 6 and × 10) are employed, fitting into a special arm inserted in the ordinary lens holder which can be moved about all over the stage. In this case the metal stage is replaced by a glass plate, the easily changed discs described above giving a white or black ground as required. Included is a reserve glass plate and a ring to fix on the mirror for holding a circular piece of white	

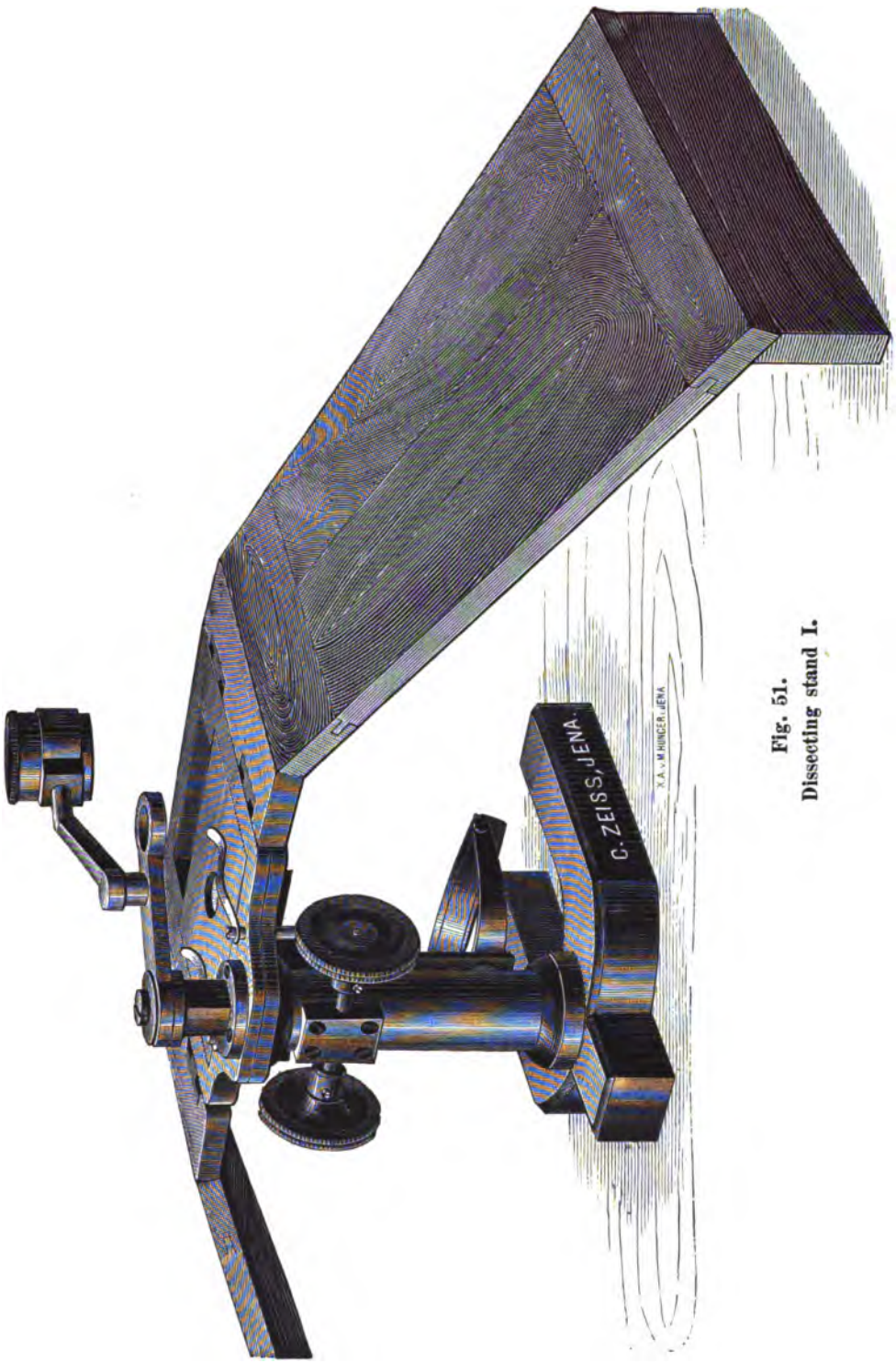


Fig. 51.
Dissecting stand I.

No.		*Marks*
	cardboard to serve as the source of light with low magnifications; also a brass plate to fit the frame, on which small dissecting saucers are fixed by paraffin and an extra holder to permit the dissecting lenses Nos. 76 and 77 being moved over the entire stage. The whole in locked mahogany case with handle. (Fig. 51.) For use with the ABBE Camera see p. 64.	
	Without lenses	100.—

Fig. 52.
Dissecting stand III.

70	***Dissecting Stand II.** The same as above, but instead of the arrangements on the stage as described there is a thick glass plate in the metal frame interchangeable with a similar	

No.		Marks
	shaped blackened brass plate; in place of the double mirror with universal motion a large plane mirror only, fixed in the axis. Otherwise arranged for Nos. 76—79.	
	Without lenses	75.—
71	***Dissecting Stand III.** (Described in former catalogues as Large Dissecting Microscope.) Heavy square stand, large stage to which is attached leather covered hand-rests. Adjustment by rack and pinion, large concave mirror. In locked case with handle. Arranged for Nos. 76—79. (Fig. 52.)	
	Without lenses	50.—

Fig. 53.
Dissecting stand IV.

72	***Dissecting Stand IV.** (Described in former catalogues as Small Dissecting Stand.) Constructed on our well known	

No.		Marks
	former model; coarse adjustment by sliding the lens holder, fine adjustment by micrometer screw acting on the lens holder. Concave mirror. (Fig. 53.)	
	a) In locked case on which it screws when in use . . .	18.—
	b) With case and separate foot, with rests for the hands .	21.—
	c) Without case, screwed to the foot	18.—
	The lenses described under the numbers from 80 to 82 are recommended as particularly suitable for this stand whilst Nos. 76 to 79 are unsuited to it.	

Fig. 54.
Dissecting stand V.

78	**Dissecting Stand V.** Small brass stand with stage, above which a lens slides up and down in a holder. (Fig. 54.)	
	a) With blocks for supporting the hands	7.—
	b) Without ditto	6.—
	Only suitable for use with lens No. 82 and doublet No. 80 (mag. 15 and 30).	

Lens Holders.

No.		Marks

Fig. 55. Lens holder I.

74	**Lens holder I.** Heavy metal foot, lens holder with hinge joints, rack and pinion for focussing	25.—

Fig. 56. Lens holder II.

75	**Lens holder II.** Heavy metal foot with vertical brass rod and sliding lens holder	12.—

The lens holders are specially constructed for use with the BRÜCKE's lenses Nos. 83 and 84, but can also be employed with other weak lenses (Nos. 79 and 81).

Dissecting Lenses.

No.		Marks
76	***Dissecting Series,** consisting of three achromatic lenses (objective) and an achromatic concave eye piece; magnifying 100 diameters with a focal distance (9 mm) permitting convenient manipulation with knife and needle during observation	30.—
	By unscrewing the third and second lens of the objective and using the latter without the eye-piece a useful series of graduated magnifications may be obtained as shown in the following table:	
	3 lenses with eye-piece 100 diameters 2 „ „ „ 60 „ 1 „ „ „ 40 „ 3 „ without „ 30 „ 2 „ „ „ 20 „ 1 „ „ „ 15 „	
77	**Dissecting Series,** consisting of two achromatic lenses (objective) and an achromatic concave eye-piece. Magnifying 30 diameters with great focal distance. On unscrewing the inferior objective lens a magnification of 15 is given. In wood capsule .	21.—
	Both series are designed for use with the dissecting stands I, II and III and cannot be employed with advantage on the smaller ones.	
78	**Aplanatic Lenses** — after STEINHEIL'S construction — composed of three cemented lenses, giving a relatively long focal distance with large flat field; the higher for use with the dissecting microscopes, the weaker as hand lenses or with a lens holder. Magnifying 6, 10, 20, each in wood capsule	12.—

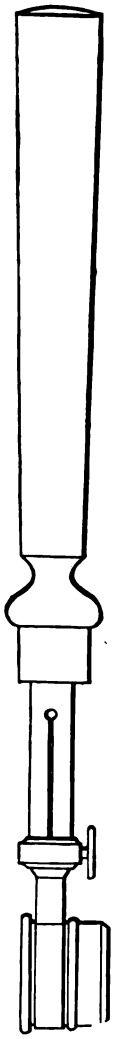


Fig. 57.

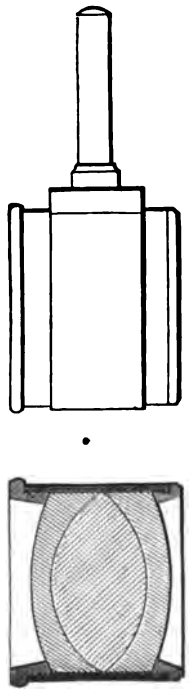


Fig. 58.
Aplanatic lenses.

No.		*Marks*
79	***Aplanatic Lenses,** of same construction, with particularly large visual field, the weaker for use with camera No. 43 (see p. 64); magnifying 6, 10; each in wood capsule	15.—

No.		Marks
80	**Doublets**, after our former construction.	
	a) × 15 in case	6.—
	b) × 30 „ „	6.—
	c) × 60 „ „	9.—
	Designed for the dissecting stands IV and V.	
81	**Magnifier**, two lenses in brass mounting, magnifying 10, lower lens alone 5, in capsule	6.—
	Designed for dissecting stands IV and V and also as a hand magnifier.	
82	**Magnifier**, same construction simplified for dissecting stand V, in wood capsule	4.—
83	**Dissecting Lens** after Brücke, with long focal distance, magnifying 4 to 5 times	11.—
84	**Dissecting Lens** after Brücke, double objective with achromatic lenses of 33mm aperture and sliding eye-piece, magnifying 5 and 10 times	30.—
	The above two numbers are specially designed for the lens holders Nos. I and II.	

Hand Magnifiers.

85	Two achromatic **lenses** of large aperture in brass mounts, magnifying 4 and 6 times	11.—
86	Two non-achromatic **lenses** in brass mounts, magnifying 6 times	6.—
87	**Achromatic Magnifier**, in ivory mount to fold, as above, with two achromatic lenses; magnifying 3, 5 and 8	12.—
88	**Magnifier** for medical purposes, two lenses of greater diameter than the above, folding for the pocket; × 4 and 8 . .	4.—

Synopsis of Magnifiers.

Designation	Magnification	Focal distance mm	Visual field mm	Price Mks.
No. 78 Steinheil × 6	6	30	15	12.—
No. 78 Steinheil × 10	10	20	10	12.—
No. 78 Steinheil × 20	20	10	5	12.—
No. 79 improved aplanatic	6	30	30	15.—
No. 79 improved aplanatic	10	22	15	15.—
No. 81 —	10	13	12	6.—
No. 82 —	10	14	11	4.—
No. 83 Brücke	5	70	20	11.—
No. 84 Brücke	5—10	70—50	13—70	30.—

Remarks. The magnification is calculated for a normal image distance of 250 mm.

The focal distance is the distance between the object and the lower surface of the lens, as adjusted by a normal-sighted observer.

The distance given above is rather smaller with short-sighted — and greater with long-sighted persons.

The same applies to the given linear diameter of the field.

These values therefore are only approximate and only intended for orientation.

Microtomes.

No.		*Marks*
	For the present we shall not supply the KORTING microtome. Of late years the more elaborate microtomes have undergone such manifold changes and have become so complicated, the ideal form moreover being a matter of opinion, that only workshops which devote themselves to this special branch under the constant guidance of experts can hope to manufacture them with any success. For some time past our labours in other directions have prevented us from paying full attention to this subject and therefore for the present we shall only make out two simple microtomes, which we know are quite capable of doing the work they are intended for.	
89	* **Microtome** after our former pattern. Round polished glass plate 80 mm in diameter, borne by two pillars on a heavy brass foot, on which the knife is worked by hand. The specimen to be cut is imbedded in a brass tube and pushed up through an opening in the plate by a screw with divided head. The divisions on the head indicate the thickness in hundredths of a mm. (Fig. 59.) With knife, in small case	40.—
90	**Hand Microtome.** Round flat brass plate 80 mm in diameter, with a cylindrical jacket to hold in the hand through	

No.		Marks

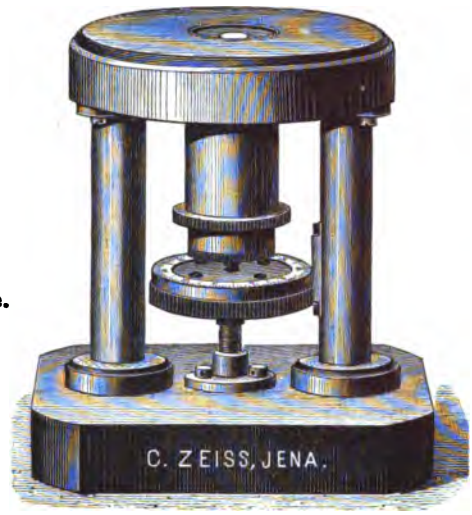


Fig. 59.
Microtome.

which the specimen is advanced by a screw. The thickness is indicated on a divided disc. For use with an ordinary razor. Without knife . . . . . 18.—

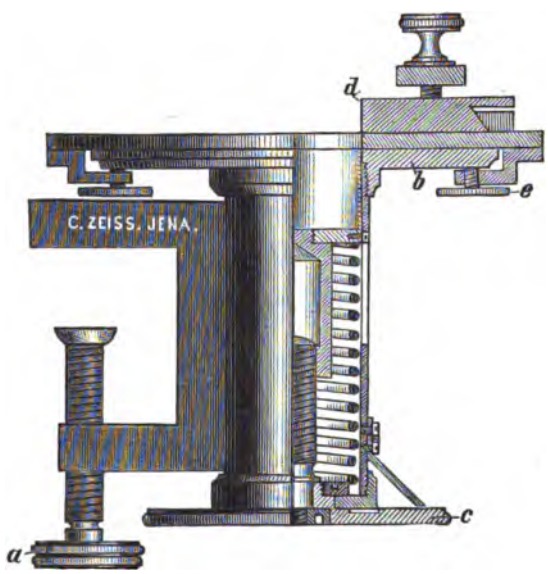
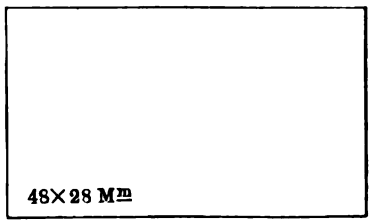
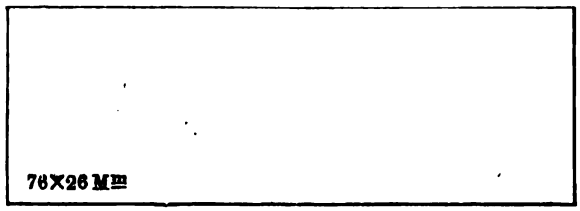


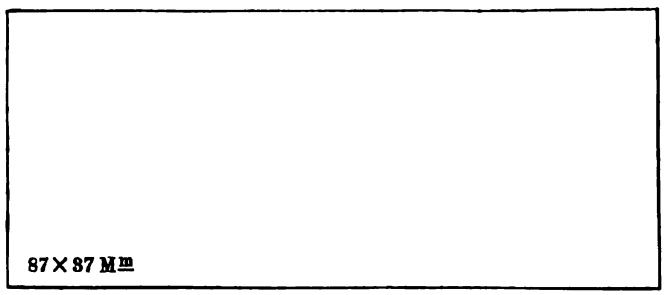
Fig. 60. Microtome after Francotte.

91 ***Microtome after FRANCOTTE,** similar to the above; the knife is worked by a metal carrier (*d*), and the whole is fixed to the table by a clamping screw (*a*) . . . . . 30.—

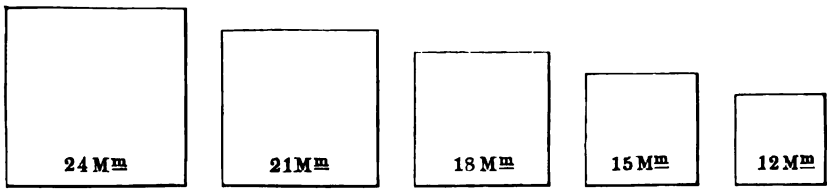
92 **Knife** for Nos. 89, 90 and 91. Large razor with straight blade and folding handle . . . . . 5.—

Slips and Covers.

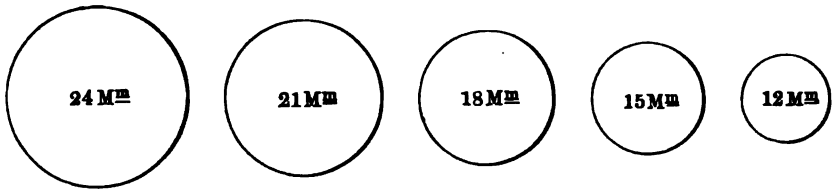
No.		Marks
93	**Slips of the Giessen pattern** 28 × 48 mm:	
		
	a) white crown-glass with ground edges, per 100	4.—
	b) „ „ „ with unground edges, per 100	2.50
	c) best white plate-glass with ground edges, per 100 . . .	6.—
94	**Slips of the English pattern** 76 × 26 mm:	
		
	a) white crown-glass with ground edges, per 100	5.—
	b) „ „ „ with unground edges, per 100	3.—
	c) best white plate-glass with ground edges, per 100	7.50

No.		Marks
95	**Slips of extra large size** 87 × 37 mm:	
		
	a) white crown-glass with ground edges, per 100	6.—
	b) „ „ „ with unground edges, per 100	3.50
	c) best white plate glass with ground edges, per 100 . . .	9.—
96	**Hollow Slips:**	
	a) small pattern, 55 × 32 mm, of best make and finish, ground edges, each	1.—
	b) extra large, 87 × 37 mm, of best make and finish, edges ground and polished, 5 mm thick, each	2.—
97	**Slips with cemented glass rings,** for moist chambers 1 or 2 mm deep, each	0.80
98	**Covers, square:**	

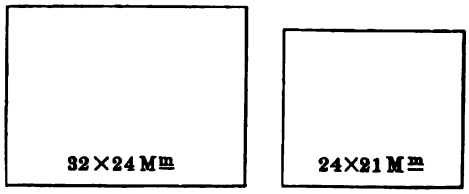
size:	24	21	18	15	12 mm □
per 100 Mk.:	4.70	3.60	2.70	1.80	1.—



No.		*Marks*
99	**Covers, round:** size: 24 21 18 15 12 mm diameter per 100 Mk.: 6.90 5.50 4.20 3.00 1.50.	



100	**Covers, oblong:** size: 32 × 24 mm and 24 × 21 mm per 100 Mk.: 6.00 and 4.50	



The thickness of the above covers varies between 0.15 and 0.21 mm; one third more must be added to the above prices for covers of given thickness.

Complete Microscopes.

For the convenience of the purchaser we have put together the following series of suitable and practical combinations with the total price appended.

In ordering either of these sets it will be sufficient to quote the number and price.

A. Optical Outfit of a complete Microscopical Laboratory.

1) Microscope:

Stand I[a] with mechanical stage . . . . . Mk. 400.—

Apochromatic Objectives:

16.0 mm,	8.0 mm,	4.0 mm		
0.30 n. ap.	0.65 n. ap.	0.95 n. ap.		
100.—	130.—	180.—	Mk.	410.—
2.5 mm (Water Immers.)				
1.25 n. ap.				
300.—			„	300.—
2.0 mm,	3.0 mm (Homog. Immers.)			
1.30 n. ap.	1.40 n. ap.			
400.—	500.—		„	900.—
			„	1610.—

Compensating Eye-pieces:

1,	2,	4,	8,	12,	18			
20.—	20.—	20.—	30.—	30.—	25.—	„	145.—
6 with $^1/_1$ micron divisions (Micrometer Eye-piece No. 29)						„	30.—

Projection Eye-pieces:

2,	4			
40.—	40.—	„	80.—
Goniometer Eye-piece No. 40		„	30.—
		„	285.—

Carried forward Mk. 2295.—

Respecting the Camerae lucidae after ABBE *(No. 43 and 44) we draw your attention to our new construction referred to in the note appended to page 64.*

		Brought forward Mk. 2295.—	
Apertometer No. 1	Mk. 60.—		
Test-plate No. 3	„ 7.—		
Sliding Objective-changer No. 25 with 6 Objective-slides	„ 70.—		
Stage Micrometer No. 26	„ 10.—		
Eye-piece Micrometer No. 27	„ 5.—		
Screw Micrometer Eye-piece No. 30	„ 60.—		
Stage Screw Micrometer No. 31	„ 120.—		
Crossed-line Micrometer No. 32	„ 5.—		
Apparatus for counting blood corpuscles No. 34	„ 30.—		
Measures on plate glass No. 37. 300 mm and 100 mm	„ 10.50		
Fully divided Circle No. 39	„ 9.—		
Cover-glass Tester No. 41	„ 36.—		
Camera No. 43	„ 30.—		
Polariscope No. 48a (Divided circle of the Goniometer Eye-piece No. 40)	„ 31.—		
Series of Selenite and Mica films No. 51	„ 10.—		
Spectroscopic Eye-piece No. 53	„ 165.—		
Bull's-Eye Lens No. 59	„ 50.—		
Stereoscopic Eye-piece No. 55	„ 150.—		
Microscope Lamp No. 62	„ 35.—		
Saccharimeter No. 64	„ 65.—		
Turn Table No. 66	„ 9.—	Mk. 967.50	
Apparatus for Mounting.			
Dissecting Microscope:			
Dissecting Stand I	„ 100.—		
Dissecting Series No. 76	„ 30.—		
Aplanatic Lenses No. 79, × 6 and 10 à 15.—	„ 30.—		
Arrangement for using the Camera No. 43 with No. 79 for low magnification	„ 8.—	„ 168.—	
Lens Holder I	„ 25.—		
with BRÜCKE's Lenses Nos. 83 and 84	„ 41.—	„ 66.—	
Microtome No. 89	„ 40.—		
Extra knife No. 92	„ 5.—	„ 45.—	Mk. 3541.50
2) Microscope:			
Stand I		„ 300.—	
Apochromatic Objectives:			
16.0 mm, 0.30 n. ap. 100.— / 8.0 mm, 0.65 n. ap. 130.— / 4.0 mm 0.95 n. ap. 180.—	„ 410.—		
2.5 mm 1.25 n. ap. 300.— (Water Immers.)	„ 300.—		
3.0 mm, 1.30 n. ap. 400.— / 2.0 mm 1.40 n. ap. 500.— (Homog. Immers.)	„ 900.—	„ 1610.—	
Compensating Eye-pieces:			
2, 4, 8, 12, 18 — 20.— 20.— 30.— 30.— 25.—	„ 125.—		
6 with 1/1 micron divisions (Micrometer Eye-piece No. 29)	„ 30.—	„ 155.—	
	Carried forward Mk. 2065.		

		Brought forward Mk.	2065.—
Apertometer No. 1	Mk.	60.—	
Test-plate No. 3	„	7.—	
Revolving Nose-piece No. 24a	„	27.—	
Stage Micrometer No. 26	„	10.—	
Cover-glass Tester No. 41	„	36.—	
Camera No. 43	„	30.—	
Polariscope No. 48a	„	46.—	
Series of Selenite and Mica films No. 51	„	10.—	
Spectroscopic Eye-piece No. 53	„	165.—	
		„	391.—

Apparatus for Mounting.

Dissecting Microscope:			
Dissecting Stand I	„	100.—	
Dissecting Series No. 76	„	30.—	
Aplanatic Lenses No. 79, × 6 and 10 . . . à 15.—	„	30.—	
Arrangement for using the Camera No. 43 with No. 79 for low magnification	„	8.—	
		„	168.—
Lens Holder I	„	25.—	
with Brücke's Lens No. 83	„	11.—	
		„	36.—
Microtome after Francotte No. 91	„	30.—	
with Knife No. 92	„	5.—	
		„	35.—
Turn Table No. 66		„	9.—
			Mk. 2704.—

3) Microscope:

Stand IIa		„	290.—
Apochromatic Objectives:			
16.0 mm, 0.30 n. ap. 100.—			
4.0 mm 0.95 n. ap. 180.—	„	280.—	
2.5 mm 1.25 n. ap. (Water Immers.) 300.—	„	300.—	
2.0 mm 1.30 n. ap. (Homog. Immers.) 400.—	„	400.—	
		„	980.—
Compensating Eye-pieces:			
2, 4, 8, 12 20.— 20.— 30.— 30.—	„	100.—	
6 with 1/1 micron divisions (Micrometer Eye-piece No. 29)	„	30.—	
		„	130.—
Apertometer No. 1	„	60.—	
Test-plate No. 3	„	7.—	
Sliding Objective-changer No. 25 with 4 Objective-slides	„	50.—	
Camera No. 43	„	30.—	
Polariscope No. 48b	„	31.—	
Spectroscopic Eye-piece No. 52	„	72.—	
		„	250.—

Apparatus for Mounting.

Dissecting Microscope:			
Dissecting Stand III	„	50.—	
Dissecting Series No. 76	„	30.—	
		„	80.—
		Carried forward Mk.	1730.—

Brought forward Mk. 1730.—

Lens Holder II . . . . . Mk. 12.—
with BRÜCKE's Lens No. 83 . . . . . „ 11.— „ 23 —

Hand Microtome No. 90 . . . . . „ 18.—
with Knife No. 92 . . . . . „ 5.— „ 23.— Mk. 1776.—

B. Larger and medium Microscopes

with sufficient outfit for most scientific purposes and especially for the investigation of Bacteria.

4) Microscope:

Stand I[a] with mechanical stage . . . . . Mk. 400 —

Apochromatic Objectives:

16.0 mm,	8.0 mm,	4.0 mm	
0.30 n. ap.	0.65 n. ap.	0.95 n. ap.	
100.—	130.—	180.—	Mk. 410.—
2.5 mm (Water Immers.)			
1.25 n. ap.			
300.—			„ 300.—
2.0 mm,	3.0 mm (Homog. Immers.)		
1.30 n. ap.	1.40 n. ap.		
400.—	500.—		„ 900.— „ 1610.—

Compensating Eye-pieces:

2,	4,	8,	12	
20.—	20.—	30.—	30.—	„ 100.—
6 with $^1/_1$ micron divisions (Micrometer Eye-piece No. 29)				„ 30.— „ 130.—

Sliding Objective-changer No. 25 with 6 Objective-slides . „ 70.—
Stage Micrometer No. 26 . . . . . „ 10.—
Camera No. 43 . . . . . „ 30.— Mk. 2250.—

5) Microscope:

Stand I[a] . . . . . „ 300 —

Objectives:

a*,	aa,	AA,	DD,	F with corr.	
40.—	27.—	30.—	54.—	104.—	„ 255.—
2.5 mm (Water Immers.)					
1.25 n. ap.					
300.—					„ 300.—
2.0 mm (Homog. Immers.)					
1.30 n. ap.					
400.—					„ 400 „ 955.—

Carried forward Mk. 1255.—

Brought forward Mk. 1255.—

Compensating Eye-pieces:

2, 4, 8, 12
20.— 20.— 30.— 30.— . . . . . Mk. 100.—

6 with $^1/_1$ micron divisions (Micrometer Eye-piece No. 29) „ 30.— „ 130.—

Revolving Nose-piece No. 24a . . . . . „ 27.—

Camera No. 43 . . . . . „ 30.— Mk. **1442.—**

6) Microscope:

Stand Ia . . . . . „ 300.—

Objectives:

a2, A, D, F with corr.
12 — 24.— 42.— 104.— . . . . . „ 182.—

J with corr. (Water Immers.)
164.— . . . . . „ 164.—

$1|_{12}$ (Homog. Immers.)
300.— . . . . . „ 300.— „ 646.—

Huyghenian Eye-pieces:

1, 2, 4 . . . . . à 7.— „ 21.—

3 with Eye-piece Micrometer (Micrometer Eye-piece No. 28) „ 15.— „ 36.—

Revolving Nose-piece No. 24b . . . . . „ 20.—

Camera No. 43 . . . . . „ 30.— Mk. **1082.—**

7) Microscope:

Stand I . . . . . „ 300.—

Apochromatic Objectives:

16.0 mm, 8.0 mm, 4.0 mm
0.30 n ap. 0.65 n. ap. 0.95 n. ap.
100.— 130.— 180.— . . . . . „ 410.—

2.5 mm (Water Immers.)
1.25 n. ap.
300.— . . . . . „ 300.—

2.0 mm (Homog. Immers.)
1.30 n. ap.
400.— . . . . . „ 400.— „ 1110.—

Compensating Eye-pieces:

2, 4, 8, 12,
20.— 20.— 30.— 30.— . . . . . „ 100.—

6 with $^1/_1$ micron divisions (Micrometer Eye-piece No. 29) „ 30.— „ 130.—

Sliding Objective-changer No. 25 with 5 Objective-slides . „ 60 —

Camera No. 43 . . . . . „ 30.— Mk. **1630.—**

8) Microscope:

Stand IIa . . . . . „ 290.—

Apochromatic Objectives:

16.0 mm, 8.0 mm, 4.0 mm
0.30 n. ap. 0.65 n. ap. 0.95 n. ap.
100.— 130.— 180.— . . . . . „ 410.—

2.0 mm (Homog. Immers.)
1.30 n. ap.
400.— . . . . . „ 400.— „ 810.—

Carried forward Mk. 1100.—

Brought forward Mk. 1100.—

Compensating Eye-pieces:

2, 4, 8, 12
20.— 20.— 30.— 30.— . . . . . Mk. 100.—

6 with $^1/_1$ micron divisions (Micrometer Eye-piece No. 29) „ 30.— „ 130.—

Sliding Objective-changer No. 25 with 4 Objective-slides . „ 50.—

Camera No. 43 . . . . . „ 30.— Mk. **1310.—**

9) Microscope:

Stand II[a] . . . . . „ 290.—

Objectives:

A, C, E
24.— 36.— 66.— . . . . . „ 126.—

$^1/_{12}$ (Homog. Immers.)
300.— . . . . . „ 300.— „ 426.—

Huyghenian Eye-pieces:

2, 4 . . . . . à 7.— „ 14.—

3 with Eye-piece Micrometer (Micrometer Eye-piece No. 28) „ 15.— „ 29.—

Revolving Nose-piece No. 24[b] . . . . . „ 20.—

Camera No. 45 . . . . . „ 21.— Mk. **786.—**

10) Microscope:

Stand IV, 1 . . . . . „ 175.—

Iris diaphragm . . . . . „ 15.—

Objectives:

a*, aa, AA, DD
40.— 27.— 30.— 54.— . . . . . „ 151.—

2.0 mm (Homog. Immers.)
1.30 n. ap.
400.— . . . . . „ 400.— „ 551.—

Compensating Eye-pieces:

2, 4, 8, 12
20.— 20.— 30.— 30.— . . . . . „ 100.—

6 with $^1/_1$ micron divisions (Micrometer Eye-piece No. 29) „ 30.— „ 130.—

Revolving Nose-piece No. 24[a] . . . . . „ 27.—

Camera No. 43 . . . . . „ 30.— Mk. **928.—**

11) Microscope:

Stand IV, 1 . . . . . „ 175.—

Iris diaphragm . . . . . „ 15.—

Objectives:

a*, A, D, F
12.— 24.— 42.— 84.— . . . . . „ 162.—

$^1/_{12}$ (Homog. Immers.)
300.— . . . . . „ 300.— „ 462.—

Huyghenian Eye-pieces:

2, 4 . . . . . à 7.— „ 14.—

3 with Eye-piece Micrometer (Micrometer Eye-piece No. 28) „ 15.— „ 29.—

Revolving Nose-piece No. 24[a] . . . . . „ 27.—

Camera No. 45 . . . . . „ 21.— Mk. **729.—**

In accordance with the increase of price of stand IV[1] as corrected on page 36, M. 25.— will have to be added to the total prices of the sets 10), 11) and 12). These prices will, however, remain unaltered, when stand IV[a] together with Condenser No. 18 is to be supplied.

12) Microscope:

Stand IV, 1 . . . . . Mk. 175.—
Objectives:
A, C, E
24.— 36.— 66.— . . . . . Mk. 126.—
$\frac{1}{12}$ (Homog. Immers. 1.20 num. ap.)
160.— . . . . . „ 160.—
„ 286.—
Huyghenian Eye-pieces:
2, 4 . . . . . à 7.— „ 14.—
Eye-piece Micrometer No 27 . . . . . „ 5.—
Revolving Nose-piece No. 24a . . . . . „ 27.—
Mk. 507.—

13) Microscope:

Stand V, 1 . . . . . „ 120.—
Iris diaphragm . . . . . „ 15.—
Objectives:
AA, DD
30.— 54.— . . . . . „ 84.—
2.0 mm (Homog. Immers.)
1.30 n. ap.
400.— . . . . . „ 400.—
„ 484.—
Compensating Eye-pieces:
4, 8, 12
20.— 30.— 30.— . . . . . „ 80.—
Revolving Nose-piece No. 24a . . . . . „ 27.—
Mk. 726.—

14) Microscope:

Stand V, 1 . . . . . „ 120.—
Objectives:
A, D
24.— 42.— . . . . . „ 66.—
$\frac{1}{12}$ (Homog. Immers. 1.20 num. ap.)
160.— . . . . . „ 160.—
„ 226.—
Huyghenian Eye-pieces:
2, 4 . . . . . à 7.— „ 14.—
Revolving Nose-piece No. 24a . . . . . „ 27.—
Mk. 387.—

15) Microscope:

Stand No. 12 after Prof. BABUCHIN . . . . . „ 285.—
Apochromatic Objectives:
16.0 mm, 8.0 mm, 4.0 mm
0.30 n ap. 0.65 n. ap. 0.95 n. ap.
100.— 130.— 180.— . . . . . „ 410.—
2.0 mm (Homog. Immers.)
1.30 n. ap.
400.— . . . . . „ 400.—
„ 810.—
Compensating Eye-pieces:
2, 4, 8, 12
20.— 20.— 30.— 30.— . . . . . „ 100.—
6 with $\frac{1}{1}$ micron divisions (Micrometer Eye-piece No. 29) „ 30.—
„ 130.—
Sliding Objective-changer No. 25 with 4 Objective-slides . „ 50.—
Mk. 1275.—

16) Microscope:

Stand VI with Illuminating Apparatus No. 19 . . . . . Mk. 75.—
Objectives:
A, D
24.— 42.— . . . . . Mk. 66.—
J (Water Immers.)
144.— . . . . . „ 144.— „ 210.—
Huyghenian Eye-pieces:
2, 4 . . . . . à 7.— „ 14.— Mk. 299.—

17) Microscope:

Stand VII with Illuminating Apparatus No. 19 . . . . . „ 70.—
Objectives:
A, D
24.— 42.— . . . . . „ 66.—
$\frac{1}{12}$ (Homog. Immers. 1.20 num. ap.)
160.— . . . . . „ 160.— „ 226.—
Huyghenian Eye-pieces:
2, 4 . . . . . à 7.— „ 14.— Mk. 310.—

C. Medium and small Microscopes

for laboratories, technical purposes and schools.

18) Microscope:

Stand IV, 2 . . . . . „ 150.—
Objectives:
A, D, F
24.— 42.— 84.— . . . . . „ 150.—
Huyghenian Eye-pieces:
2, 4 . . . . . à 7.— „ 14.—
Eye-piece Micrometer No. 27 . . . . . „ 5.—
Camera No. 43 . . . . . „ 30.— Mk. 349.—

19) Microscope:

Stand V, 2 . . . . . „ 95.—
Objectives:
AA, DD
30.— 54.— . . . . . „ 84.—
Huyghenian Eye-pieces:
2, 4, 5 . . . . . à 7.— „ 21.— Mk. 200.—

20) Microscope:

Stand VI . . . . . „ 65.—
Objectives:
A, C, E
24.— 36.— 66.— . . . . . „ 126.—
Huyghenian Eye-pieces:
2, 4 . . . . . à 7.— „ 14.— Mk. 205.—

21) Microscope:

Stand VII	Mk. 60.—	
Objectives:		
A, D, F		
24.— 42.— 84.—	„ 150.—	
Huyghenian Eye-pieces:		
2, 4 . . . . . à 7.—	„ 14.—	Mk. 224.—

22) Microscope:

Stand VII	„ 60.—	
Objectives:		
A, D		
24.— 42.—	„ 66.—	
Huyghenian Eye-pieces:		
2, 4 . . . . . à 7.—	„ 14.—	Mk. 140.—

23) Microscope:

Stand IX	„ 30.—	
Objectives:		
a[1], A, C		
12.— 24.— 36.—	„ 72.—	
Huyghenian Eye-pieces:		
2, 4 . . . . . à 7.—	„ 14.—	Mk. 116.—

24) Microscope:

Stand IX	„ 30.—	
Objective:		
C		
36.—	„ 36.—	
Huyghenian Eye-pieces:		
1, 3 . . . . . à 7.—	„ 14.—	Mk. 80.—

25) Hand Microscope:

Stand No. 16	„ 15.—	
Objectives:		
A, C		
24.— 36.—	„ 60.—	
Huyghenian Eye-pieces:		
1, 3 . . . . . à 7.—	„ 14.—	Mk. 89.—

26) Microscope for the detection of Trichina after Professor JOHNE:

Stand IX with specially constructed dividing Objective and 2 Eye-pieces; 6 magnifications from 30—190 . . . . . Mk. 60.—

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Frommannsche Buchdruckerei (Hermann Pohle) in Jena. — 553

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